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ANNUAL REPORT

OF THE

State Engineer and Surveyor

OF THE

With the Compliments of

Frank M. Williams

State Engineer and Surveyor.

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1910

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J. B. LYON COMPANY, PRINTERS
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ANNUAL REPORT

OF THE

State Engineer and Surveyor

OF THE

STATE OF NEW YORK

For the Fiscal Year Ended September 30, 1909

TRANSMITTED TO THE LEGISLATURE JANUARY 24, 1910

ALBANY
J. B. LYON COMPANY, PRINTERS
1910

STATE OF NEW YORK

No. 22.

IN ASSEMBLY

JANUARY 24, 1910.

ANNUAL REPORT

OF THE

STATE ENGINEER AND SURVEYOR

OF THE

STATE OF NEW YORK

OFFICE OF THE STATE ENGINEER AND SURVEYOR,

ALBANY, N. Y., *January* 24, 1910.

To the Honorable the Speaker of the Assembly:

Sir.— I have the honor to transmit herewith my annual report for the fiscal year ended September 30, 1909.

Very truly yours,

FRANK M. WILLIAMS,

State Engineer and Surveyor.

TABLE OF CONTENTS.

PAGE.
Report of the State Engineer and Surveyor 7
  Engineering expenses for the fiscal year ended September 30, 1909 .. 35
  Table of contracts completed during the fiscal year ended September 30, 1909 38
  Table of contracts pending February 17, 1909 (Improvement of Public Highways) 41
  Table of contracts pending September 30, 1909 45
Report of the Division Engineer of the Eastern Division 49
Report of the Division Engineer of the Middle Division 125
Report of the Division Engineer of the Western Division 185
Report to the Senate by the State Engineer on the proposition to increase the Cayuga and Seneca canal to Barge canal dimensions 243
Report of the Cayuga and Seneca canal survey, under chapter 433, Laws of 1909 249
Report of Tests 255
Report of the Land Bureau 263
Report of the Bureau of Bridges 266
Report of Tests of Concrete Arches — Models of the Medina Aqueduct .. 269
Report of Resurveying and Remonumenting the New York–Connecticut Boundary Line 285
Report of an Inspection of an Accident to the Sault Ste. Marie canal lock 295
A Memorial of the first boat to navigate the State canals from Seneca lake to New York city 303
Report of the Coöperative Topographic Survey of New York state 307
Report on the Gaging of Streams for 1909 313
Index of illustrations 553
Index 555

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REPORT.

To the Honorable the Legislature of the State of New York:

I have the honor to present herewith my first annual report as State Engineer and Surveyor of New York.

The Constitution of the State, the Revised Statutes and the laws that are passed at the several sessions of the Legislature place upon the State Engineer and Surveyor certain duties in connection with some of the public works of the state and this report shows in detail how he has carried out these duties during the past year.

In general the duties of the State Engineer and Surveyor may be described as consisting of the engineering operations required in the making of surveys and preliminary investigations and in the designing of certain State public works and the supervising of their construction and maintenance. The most important of these works is the enlargement of the State canals, authorized by the people of the state in referenda submitted for their approval. Ever since the creation of this office, the building, repair and improvement of the canal system have been first among the duties of the State Engineer and Surveyor, except for a few recent years, when the improvement of State highways demanded an equal share of his attention.

For nearly eleven years the work of highway improvement was entrusted to this Department. To the careful study and earnest efforts of some of my predecessors is due the credit of developing this enterprise from its first stages to a high degree of efficiency and popularity throughout the state. Inasmuch as this work was under the supervision of this Department for four and a half months of the fiscal year covered by this report, an account of what was accomplished during that time will be included herein, although the work passed from my hands in the second month of my administration.

The State Engineer and Surveyor is a member of several constitutional and permanent statutory boards, which not only require his participation in their general work as boards, but also, by reason of the nature of his office, refer to him many subjects for his special investigation and report. These boards and their duties are as follows:

The Canal Board.— Controlling the construction and maintenance of canals.

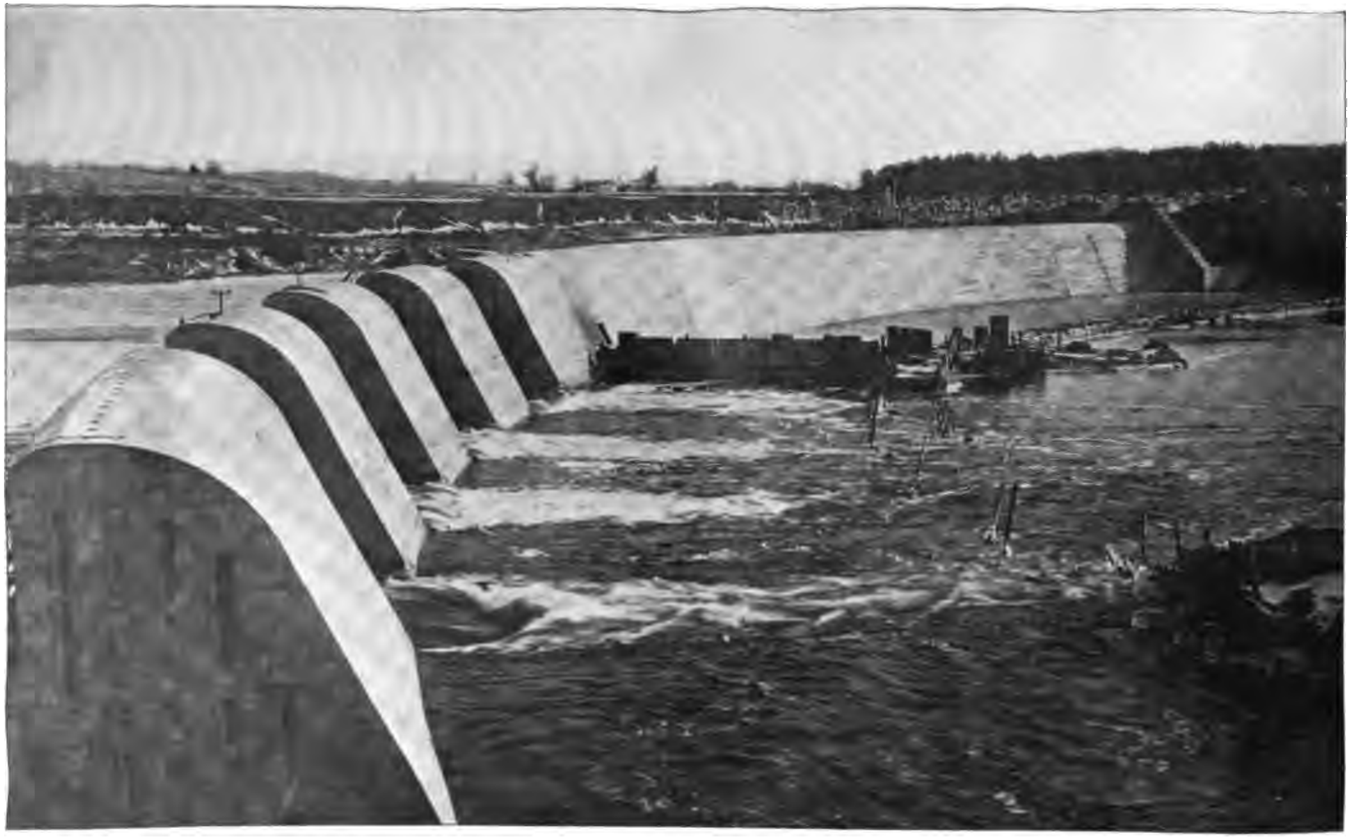
The Board of Commissioners of the Land Office.— Controlling the sale and purchase of State lands, and the granting of lands under water.

The Board of State Canvassers.— Canvassing the returns of elections.

The Board of Equalization of Assessment.— Equalizing the assessment of State taxes among the several counties.

From time to time the Legislature creates commissions for some particular work of a somewhat temporary character and of these the State Engineer and Surveyor is sometimes a member. The Legislature of 1909 created a body of this nature — the Canal Terminal Commission — of which the State Engineer and Surveyor is chairman.

In addition to the duties which devolve upon him by reason of his relation to the state waterways or of his membership of these various boards and commissions, the State Engineer and Surveyor is charged with many other tasks, among which may be enumerated the following: He is called upon to make maps for the use of the Attorney-General in the defense of suits before the Court of Claims; he is entrusted with the sale of lands at public auction, authorized by the Land Board; he is required to examine and pass upon bridge plans presented by electric or steam railways or others for use in crossing the canals; he is often directed by the Legislature to survey and monument boundary lines between counties of the state or between New York and adjacent states or Canada; he is authorized at stated intervals to report upon the condition of the state boundary line monuments; he is often requested to make surveys by the various State boards, commissions or departments not having engineering corps of their own; he is charged with directing the Geological Survey of the state in coöperation with the United States Government, including the topographic surveys and the gaging of flow of streams; he is often asked to furnish estimates and reports on proposed legislation, and to perform other allied duties for the Legislature.



BARGE CANAL, CONTRACT NO. 14.
View of the eastern portion of the dam near Crescent.

CANAL MAINTENANCE.

During the past year the maintenance of the present canal system has been continued under the provisions of the general and special acts of the Legislature, the design and construction of the various works specified by these acts having been carried on under the direction of the State Engineer. Under special acts two lift bridges have been constructed and plans have been made for two more.

As in the past, the specifications have been modified wherever necessary in order to keep abreast of the times and in accord with the latest and most improved methods employed by engineers in the design and construction of similar works. The preparation of these standard specifications has received continued attention.

The State canals are in excellent condition and the Superintendent of Public Works is deserving of great credit for the manner in which they have been maintained. The towing-paths in particular have been resurfaced in several localities, drainage has been provided for and they are in general in much better condition than they have been for some years. During the past year there have been very few breaks. They have been of a minor character and repairs have been prompt and efficient.

One of the recognized features of modern and improved construction is the constantly increasing use of Portland cement concrete as a substitute for the more expensive cut-stone masonry, which was formely used. Concrete is now generally specified for masonry structures and the requirements and the tests of Portland cement have been advanced and modified to accord with the great improvement made in recent years by American manufacturers, with the result that none but the best qualities of cement are used on State work. The best laboratories in this and other states have been visited, and their methods considered and adopted where it was thought desirable, so that the State now possesses one of the best laboratories in the country.

BARGE CANAL.

That the building of the Barge canal has made rapid strides during the past year, must be evident to all who have watched its progress. In this short time almost as much construction work has been accomplished as during the whole period up to a year ago, while the plans completed equal 80 per cent of the amount of similar work done in any previous two years, considering both mileage and size of estimates.

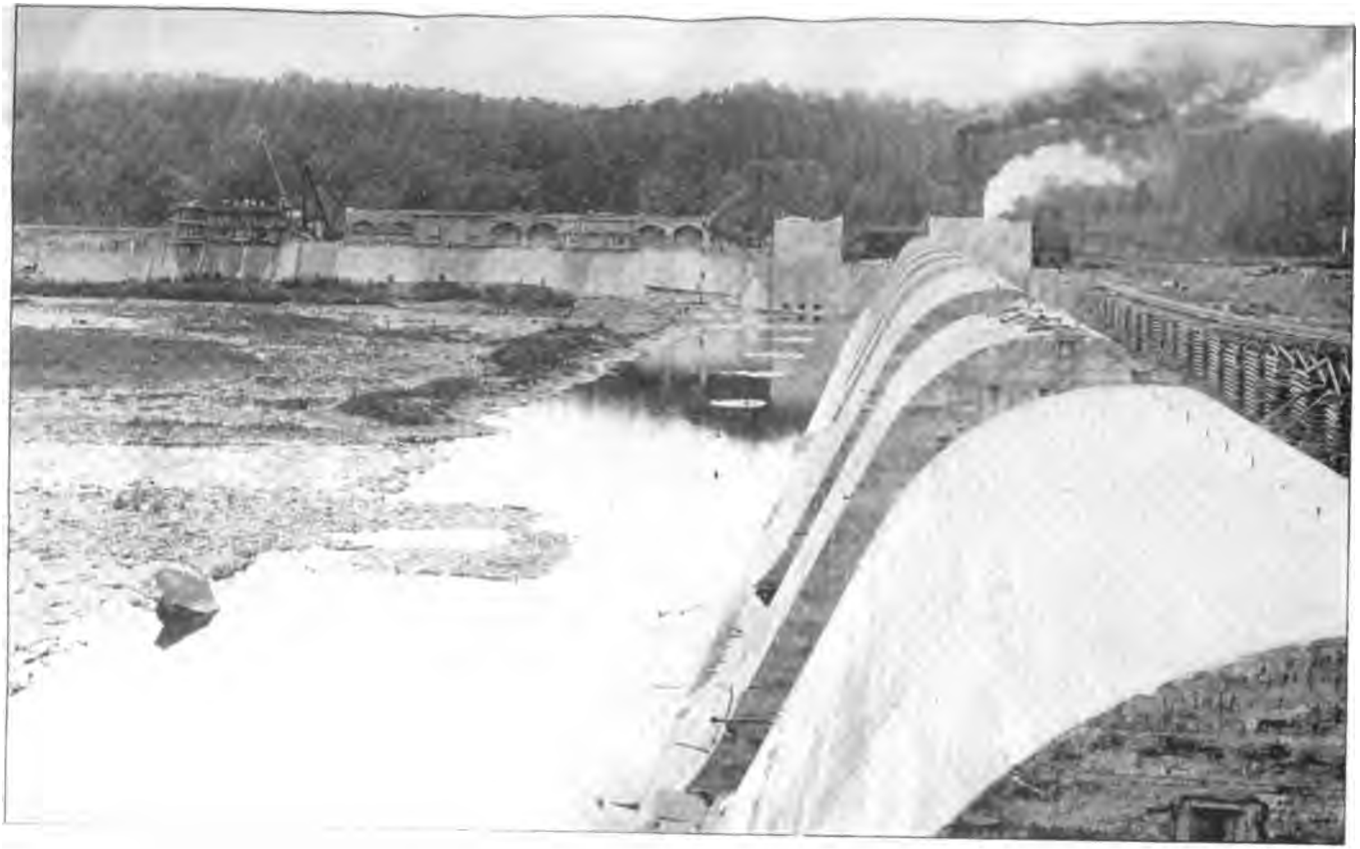
STATUS OF WORK.

At the end of 1909 there are 314.2 miles of canal under contract at prices aggregating $54,138,329. Additional plans for 67.7 miles are completed, while the plans for 9 miles more are over 75 per cent finished and the plans for the remaining 20.5 miles are well under way. With some 22 miles of additional lake navigation, not included in this enumeration, a total of about 433 miles is reached, which is the whole length of the Erie, Oswego and Champlain branches of the Barge canal system, exclusive of the Niagara river, which is being improved by the Federal Government, and the Hudson river below Waterford, which it is anticipated the Government will undertake. Thus it will be seen that 76 per cent of the total length is under contract, and it is expected that the whole of it will be let by April 1, 1910, with the exception of some minor structures and operating machinery which it would not be advisable to put in place at this time, on account of expense of maintenance.

Fifteen of the fifty-three new locks are now completed, with the exception of gates and operating machinery, and in some of the structures these are now being installed. By a year from next spring the eight movable dams in the Mohawk river will be in operation and will be used to aid in the dredging of the channel, by retaining water for the floating of dredging machinery. The large fixed dam across the Mohawk river near Crescent will be finished during next summer, as will also the concrete dam impounding the waters of the upper Mohawk at Delta in a reservoir having a flooded area of 2,800 acres.

RECORD OF 1909.

With considerable satisfaction I can call your attention to the accomplishment of 1909. At its close the total value of all construction work equals $16,291,325. As the record to the end of 1908 was $8,701,323, it appears that nearly half of all the work done thus far has been performed during the past year. It should be noticed, also, that several contracts were let so late in the year



BARGE CANAL, CONTRACT No. 14.
View at Vischer's Ferry, showing alternate completed sections of western portion of dam and lock under construction.

that they have contributed but little to the record, complete plants not having yet been installed.

When compared by years, the excellence of this year's record is manifest. At the end of 1905, $330,120 had been expended; by the close of 1906 the total was $1,042,926, while the sum had reached $3,257,461 and $8,701,323 at the ends of 1907 and 1908, respectively.

Of the 314 miles of canal under contract 120 miles, or 38 per cent, have been awarded during 1909. If the money value of these contracts is considered, the ratio is about the same. The total of contracts let during the year amounts to nearly nineteen million dollars, or more than one-third of the whole under contract.

WHOLE CANAL WITHIN APPROPRIATION.

It is a pleasure to state that the work of construction is being done within the original estimates. This is determined by comparing the contract prices with the estimate made in 1903, upon which the appropriation was based. With three-quarters of the work under contract, it seems assured that all the construction contemplated by the Barge Canal Act will be entirely completed within the original appropriation.

The 1903 estimate for construction on the portions of the canal now under contract amounted to $56,791,537, while the contract price for this work, as revised by alterations to date, is $54,138,329. This is a saving of $2,653,208.

However, the Legislature should steadfastly resist any and all attempts to saddle upon the undertaking work of whatever character not included in the original law. To meet possible contingencies and claims for damages, which are still somewhat problematical, the whole appropriation should remain intact. While it would be folly or worse to meddle with this fund, it will be to the everlasting credit of the State to complete so vast an enterprise in a reasonable time and within the original appropriation.

PORTIONS UNDER CONTRACT.

The 314 miles of canal under contract cover the following stretches of work:

Erie canal.— Waterford to near Lyons; Irondequoit creek; Kings Bend to Genesee river; Rochester to Monroe-Orleans county line; Eagle Harbor to Beal's bridge; Medina to Lockport, and Lockport to Ellicott creek.

Champlain canal.— Waterford to Stillwater and Northumberland to Whitehall.

Oswego canal.— Phœnix; Fulton; Oswego.

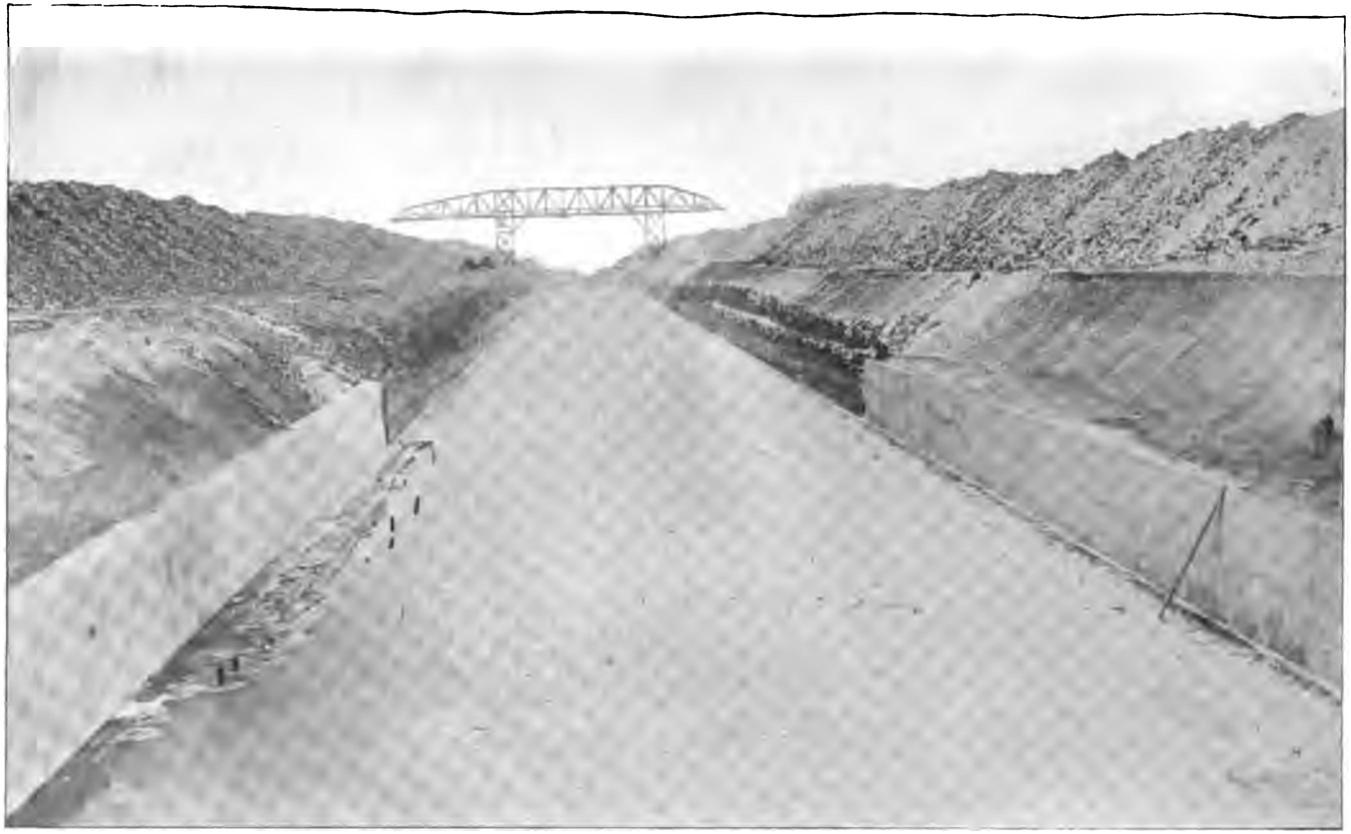
Water-supply.— Delta reservoir.

It will therefore be noted that the Erie branch of the canal is all under contract in continuous sections between the Hudson river and the city of Lyons and that there are only a few sections not under contract between Lyons and the Niagara river. Also that the Champlain branch is all under contract with the exception of the fifteen miles lying between Stillwater and Northumberland. Plans and estimate of cost for this section have been prepared and approved by the Advisory Board of Consulting Engineers and will be advertised for bids during the month of January. Plans for the construction of the remaining great storage reservoir — that at Hinckley — have been approved by the Advisory Board and the Canal Board and this contract should be let early in February.

HUDSON RIVER, TROY TO WATERFORD.

It is imperative that no time be lost in doing everything possible to hasten the procuring of a Government appropriation for canalizing the Hudson river between Troy and the Barge canal terminus at Waterford.

It will be recalled that agitation for this purpose has been going on for several years. First in 1905, just before the commencement of actual Barge canal construction, the Governor, in his annual message, urged upon the Legislature the necessity of pressing New York's claims for larger Federal appropriations. Twice since that time my predecessors have formally appealed to Congress to have the Government extend its operations in the Hudson northward from Troy to meet the State's canal enlargements. It seems now that Government officials are disposed to grant the desired aid, but, unless there is haste, it will come so late as to prevent the opening of the Barge canal upon its completion, or at least the completion of the Champlain branch of the canal.



BARGE CANAL, CONTRACT NO. 6.
View east of Lyell road, showing canal prism with vertical walls and an adjoining channeled rock section.

For several years there has been spreading throughout the land a sentiment in favor of improving our waterways. This movement has already assumed large proportions, as evidenced by the well-attended and enthusiastic conventions of both national and state waterway associations, that have so focussed public attention upon the subject as to betoken speedy action toward the accomplishment of this end. Doubtless this general awakening will help New York to secure the aid we are seeking. In the past this State has received much less than its just proportion of Federal appropriations. If our delegates to these national conventions are active and our members of Congress, our Legislature and our State officers are insistent, New York's claims must be recognized and our object attained.

Early in 1909 the Superintendent of Public Works of this State was instrumental in securing a Federal appropriation for surveying the Hudson with a view to making plans and estimates for a suitable Barge canal outlet. About a month ago the Chairman of the House Rivers and Harbors Committee assured a body of representatives from this state that he would do what lay in his power to induce the Government to undertake and complete work in the Hudson between Troy and Waterford in time for Barge canal traffic, but he also stated that the report of the recent survey had not been received and that no action could be taken at the present session of Congress unless it should be rendered within a short time.

It is imperative that everything be done to hasten this Government appropriation, for indications now point to the early completion of the Champlain canal. It is all under contract, except one section of fifteen miles, which will shortly be advertised; a considerable portion is already finished, and probably the whole of the Champlain branch will be ready for navigation in the spring of 1913. I recommend that the Legislature exert its influence to secure this appropriation and be insistent in its demands for speedy action.

CAYUGA AND SENECA CANAL.

At the recent general election the people of the state voted to include the Cayuga and Seneca canal in the Barge canal system. The first official action, looking toward this end, was taken in

1905, when, in compliance with a legislative enactment of that year, the State Engineer made a survey and estimate of cost of a route to connect Cayuga lake with the main line of the Barge canal near Fox Ridge. If such connection were to be made, it seemed best at that time to change the alignment of a portion of the main canal and investigations were made for this purpose. Subsequently these studies led to this alteration of route by legislative enactment, although the possible future extension to Cayuga lake was but one of the determining factors.

The Legislature of 1909 made appropriation for a survey of this canal without waiting for the result of the referendum. During the summer and fall this survey has been in progress and a report of the work accomplished to the present time will be appended hereto. For the earlier starting of construction work it is fortunate that this survey has been made, since the data thus obtained will now be available to aid in making final plans and estimates.

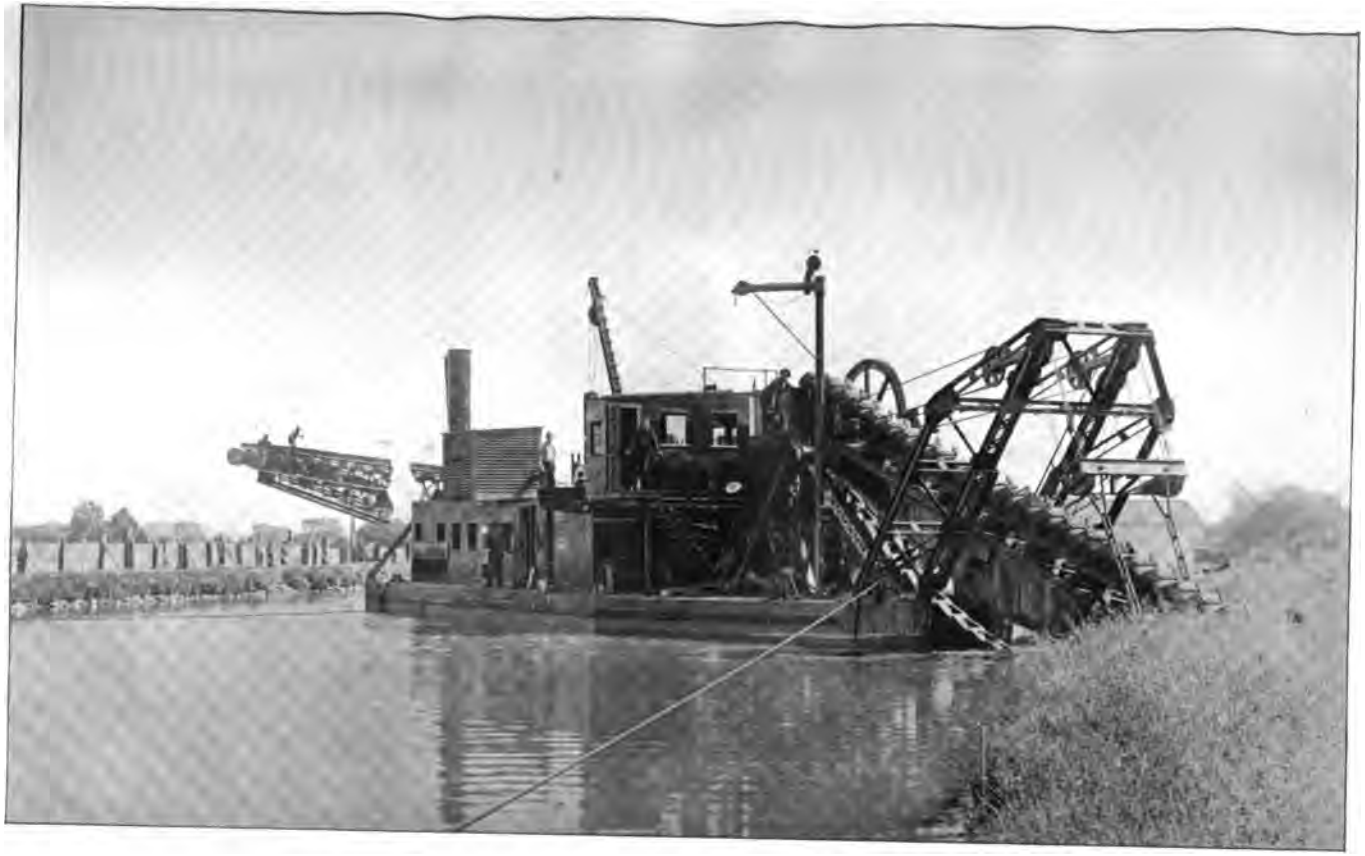
CANAL TERMINAL COMMISSION.

After recommendations by the State Engineer and the Superintendent of Public Works for two years and also considerable agitation by canal advocates, the Legislature of 1909 created a canal terminal commission, consisting of the State Engineer, the Superintendent of Public Works, the Chairman of the Advisory Board of Consulting Engineers and the Special Examiner and Appraiser of Canal Lands. Their task was to inspect the canal harbors connected with the Barge canal, as well as harbors where canal freight is either shipped or delivered, and to report to the Legislature their findings, together with an estimate of the structures and land necessary for proper terminals, their cost of construction and maintenance and the revenues, if any, to be derived.

It is not my intent to forestall the report of this commission, but simply to state that its members appreciate the importance of proper terminals as a necessary part of the Barge canal project, if the full benefit of the enlarged channel is to be secured.

INSPECTION OF STEEL.

The inspection of the quality of steel, iron and other metals used on the canals must, with unimportant exceptions, be performed at the mills where the material is rolled or at the foundries



BARGE CANAL. CONTRACT No. 66.
Front view of ladder-dredge.

where it is cast. The inspection of the shop workmanship, which includes punching, shearing, riveting, etc., and all machine work, must be performed, before shipment, at the shops where such work is done. Because the work of rolling, casting and fabricating is unavoidably done in scattered mills and shops, many of which are without the borders of the state, it is necessary to have such inspections performed by one of the many bureaus organized expressly for the purpose of making these inspections. Such companies perform inspection for many clients and are therefore able economically to station competent representatives in each of the mills or districts where work is in progress. It is well known in engineering circles that much of the so-called inspection done at low prices is perfunctory and of little value, and is necessarily so from economic reasons. The specifications for this class of work, as drawn by the State Engineer and approved by the Advisory Board of Consulting Engineers, provide for construction of a high standard of excellence and are free from unreasonable requirements that will unnecessarily increase the cost of the work. It is of the utmost importance for the safety of all canal structures that the work be executed throughout in full conformity with the spirit and intent of the specifications and to this end it is also important that the inspection be of more than the ordinary excellence, the cost of such inspection being necessarily increased. Special attention has therefore been given this subject by the State Engineer and a contract made with a responsible inspecting company, covering all inspection at mills, foundries and shops during the term of the present administration. The work of this company receives constant attention on the part of the Bureau of Bridges and is proceeding satisfactorily.

BARGE CANAL BULLETIN.

I have continued issuing the monthly *Barge Canal Bulletin,* which apparently fills a distinct need. It not only furnishes necessary information to the engineers, the contractors and many others more or less directly connected with the canal's construction, but it also serves very generally as a means of public information and education. The press of the state is becoming more interested in reprinting excerpts or publishing synopses of its reports. The people of the state have authorized this undertaking and it seems but proper that they should be regularly told of its progress.

The *Bulletin* has rendered a very practical service in keeping contractors informed of the work to be let and of prices being tendered, thus helping to arouse more active competition, which, doubtless, has resulted in the saving of many dollars for the State.

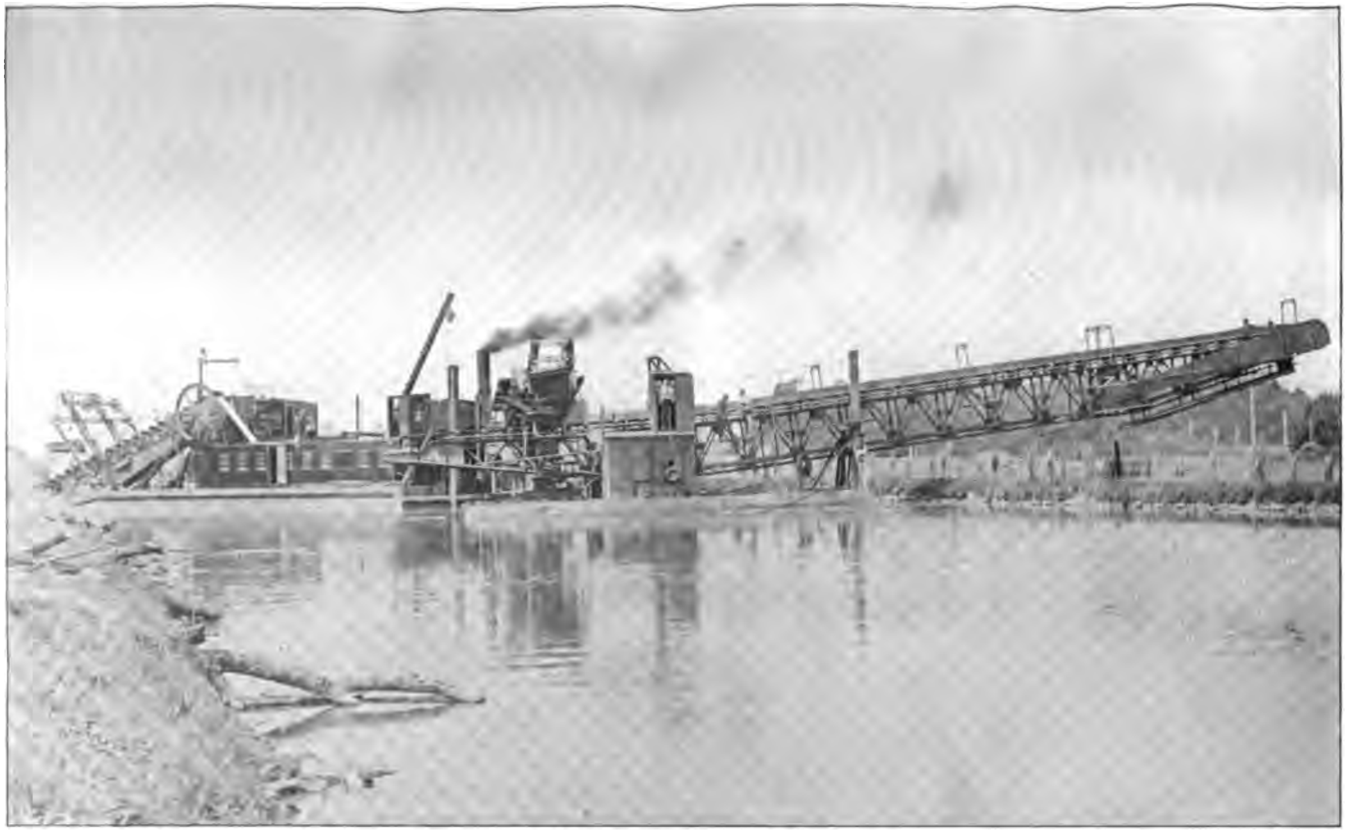
A FEATURE OF LOCK CONSTRUCTION.

An accident last June at the lock on the Sault Ste. Marie canal, the Canadian canal between Lakes Huron and Superior, has emphasized the wisdom of a device that has been included in the plans for locks on the Barge canal.

The accident was caused by a boat outside the lock crashing into a lower gate, causing the dislodgment of this and its companion gate, followed by the carrying away of the two upper gates by the rushing water and the tearing out of a miter-sill and a part of a miter-sill wall. Two steamers were slightly injured and another so badly that it sank. The damage amounted to nearly $50,000.

In planning the Barge canal locks provision has been made for placing a buffer-beam at each end of every lock. This consists of a heavy structural steel beam, which is enclosed within a recess in the lock wall, when not in use, but which swings on a pivot at one end, while the other end may be thrown across the lock chamber and rest against a notch in the opposite wall. The mere presence of this beam is a distinct advantage on the side of safety, in that a boat will have to stop some eighty feet from the gates in order to give room for swinging the buffer from across the channel, while, without the beam, boats might proceed to within a few feet of the gates without being required to back up for their opening. On the other hand, in case of misunderstood signals, a boat cannot hit the gates until the buffer has been destroyed, by which time, if the boat is not stopped, its velocity will be so reduced that the chance of seriously injuring the gates will be very small. The breaking load of a buffer-beam, if the load is concentrated at the center, is 350,000 pounds.

A report by a member of this Department, of a personal inspection of the injured Canadian lock shortly after the accident and while repairs were in progress, will be appended hereto.



BARGE CANAL, CONTRACT No. 66.
Rear view of ladder-dredge, showing method of conveying excavated material to spoil bank.

SPECIAL HYDRAULIC INVESTIGATION.

In connection with the work of the bureau of hydraulics one important investigation may be mentioned. At the opening of navigation in the season of 1909 a series of special observations was taken to determine the rate of filling of the long level of the Erie canal between Lockport and Rochester. The Barge canal will occupy part of the same route as the Erie canal between these points, and in connection with the Barge canal the question of slope of water, rate of advance of a flood wave and rate at which the prism can be refilled after being emptied, are matters of some importance. Although these questions have been the subjects of investigation by canal officials at various times through a long period of years, yet no actual experiments had ever been made to determine the slope or rate of filling this unusually long canal level. The past season being the last in which this portion of the Erie canal would remain substantially unchanged, it was evident there would not be another opportunity for obtaining experimental data of this character until the Barge canal should be completed. Therefore a series of observations, which are fairly complete, was obtained during the period of refilling the canal in the spring of 1909.

MAINTENANCE.

Such portions of the completed Barge canal or its structures as are identical in location with the existing canals will naturally be cared for by the Superintendent of Public Works in his general work of maintenance, but for maintaining finished sections on new locations no fund is now available. Instances of a few needed repairs have occurred on the completed channel near Fox Ridge, and others may occur at various places. These expenses cannot properly be considered as construction charges, and accordingly an appropriation should be made, in order that the work may not suffer for lack of a few repairs and so result in a larger expense in the future.

CHARTING OF CANALIZED RIVERS AND LAKES.

A work that should receive the attention of the Legislature at this time is the proper charting of the rivers and lakes that are to be canalized in constructing the Barge canal. The United

States Government does similar work on the waters it improves and it will be found an absolute necessity under new conditions in this state also.

The Barge canal law contains no authorization for charting, although much data collected in the course of construction will be available for such work, making the cost proportionately less. The Legislature, therefore, must make suitable provision for this purpose and also for the printing and sale of the completed charts. For advantageously carrying on the work of construction, at certain places canal traffic will have to be turned into the new river channels before the whole is completed. Accordingly this work of charting cannot longer be delayed without menace to successful navigation.

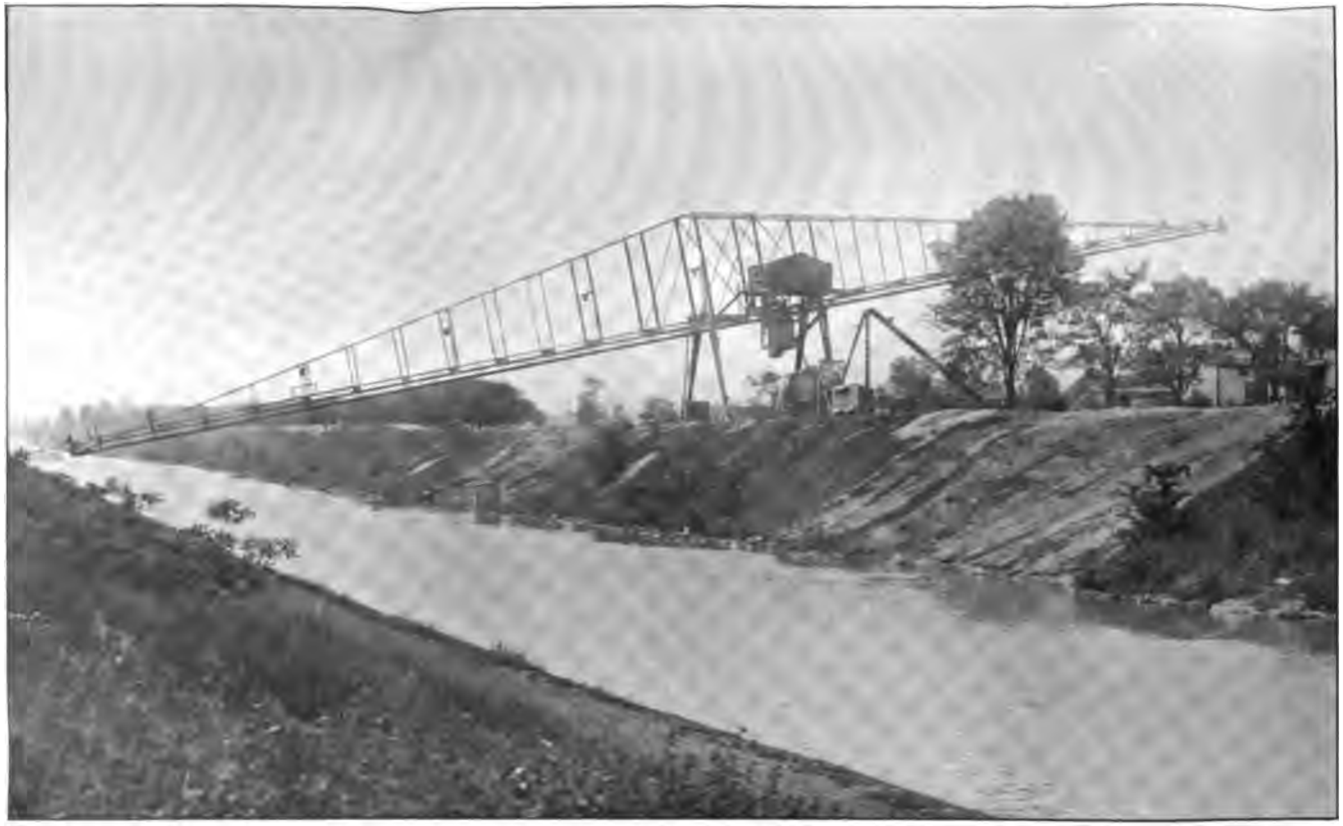
WATER-POWER DEVELOPMENT.

Under the law the State is prohibited from disposing of any water-power created by Barge canal construction. While the intent of the law is good, there are times when it results in positive loss to the State. If it were possible to exchange new for old power development in places where existing power is destroyed and new power developed on the same site, or to offset damages by grants of power in some form, numerous transactions of advantage to the State might be effected. Also at two sites, Vischer's Ferry and Crescent, there will soon be power possibilities from surplus waters amounting to six thousand horse-power at each place that will go to waste for several years, if none of the power can be disposed of until the whole canal is completed. The same condition will exist at several other points where smaller powers have been or will be developed.

Accordingly it seems wise that the Legislature should give the Canal Board, or other responsible body, discretionary powers in such matters, authorizing them to lease water-power on such terms, carefully safeguarding the navigation interests of the State, as may be prescribed by the Legislature. Possibly a lease for twenty-five years, with the privilege of renewal for fifteen years, would be equitable to both lessee and State.

RECOMMENDATIONS.

I desire to gather together and reiterate such recommendations as I have made relative to the Barge canal, and to add one other.



Barge Canal, Contract No. 40.
View of a cantilever excavator, operated by electric power.

UofM

I recommend that your honorable body coöperate in an earnest attempt to secure Government aid for canalizing the Hudson river below the canal terminus at Waterford and that an effort be made to secure such assistance quickly.

I also recommend an appropriation for maintaining such completed portions of the Barge canal as will not come under the supervision of the Superintendent of Public Works for making repairs till the whole canal is completed.

I further recommend that an appropriation be made now available to commence the work of charting the streams and lakes utilized for the Barge canal.

I repeat that it seems wise that the Canal Board, or other responsible body, be empowered to deal with matters pertaining to the lease or exchange of water-power development. This subject should receive your careful attention.

In building the Barge canal certain elevated areas, called spoil banks, are created by depositing the material from excavation. Where these occur near cities or villages it seems that a very desirable use can be made of them by allowing the municipalities to convert them into parks. In the vicinities of Amsterdam, Schenectady and other smaller towns there will be such areas, which, doubtless, would be of great value to the localities for park locations. These parcels of land should be granted to the adjoining municipalities for development as parks only, upon payment of the cost to the State of acquiring them, and the State should reserve simply the right to reënter for canal purposes. I commend this as a subject worthy of your consideration.

HIGHWAY IMPROVEMENT.

From the inception of systematic, State-aided highway improvement in 1898 to the beginning of 1909 this branch of public works was in charge of the State Engineer's Department, but at the beginning of my administration it was turned over to the Highway Commission created by a legislative act of 1908. It was anticipated that the transfer could be made by the middle of January, but complications arose to delay the appointment of the last member of the Commission and it was necessary for me to maintain the organization and carry on the work till February 17, when the change was made. Handicapped by uncertainties and embarrassed by inability to formulate policies and secure most efficient results, I was forced to be content with little beside routine duties, preserving the department in as good shape as possible for turning over to my successors in the work.

For the purpose of making the records complete, reports of highway improvement between September 30, 1908, and February 17, 1909, will be found appended.

TESTING LABORATORY FOR STATE WORKS.

For many years the State Engineer's Department has included a testing laboratory where are made tests of all hydraulic cements used for State work, not only for the numerous works which are under the direction of the State Engineer, but also for those supervised by the State Architect, in the many buildings which he constructs. The character and importance of the work being done on the Barge canal has also necessitated the testing of sand submitted for use in the large concrete structures. The testing of cement and stone for State highway improvement is still carried on in this laboratory, though at the expense of the Highway Department.

The methods of cement testing are in accord with the latest and best practice and insure the use of none but the best cements for State work. The high grade of requirements has been maintained during the year, thus keeping up with the improved methods and products of American manufacturers of Portland cement.

Cement proposed for use in large quantities on the Barge canal is now generally sampled at the cement mill and this has become a very important branch of the work of the laboratory.

The detailed account of the year's work will be found in the appended report of the Resident Engineer in charge of the laboratory.

COURT OF CLAIMS SURVEYS.

For years it has been the practice for engineers of this Department to make surveys and present evidence on behalf of the State in cases that come before the Court of Claims in their hearing of claims for damages alleged to have been caused by State public works, especially the canals and their adjuncts. This evidence is usually a large factor in the case and has saved much money to the State in disproving unjust and excessive damages.

This Court is now almost exclusively engaged in disposing of Barge canal claims, and the preparation of expert evidence for these cases devolves upon the engineers of this Department. This includes the gathering of much data and the ability of these engineers to qualify as experts in their respective branches of the profession.

Probably the most important questions involved in much of this litigation are those of a hydraulic character, and for a full understanding of these the records which the State Engineer's Department has been accumulating for several years are of inestimable value.

The complete photographic record of lands or buildings appropriated, furnishes other valuable evidence before the Court. Since the beginning of construction on the Barge canal, the official photographers of this Department have had the making of these pictures as a part of their duties.

Accounts of the work thus done will be found in the appended reports of the Division Engineers.

In view of the constantly increasing amount of work required in making these surveys and preparing this evidence, I recommend that an appropriation of $5,000 be made for this purpose for the coming year.

LAND BUREAU.

This bureau of the State Engineer's Department has charge of the sale of State land and of the custody and care of ancient records. The ancient records of this Department, as well as the modern ones, are of great value for reference, and it has been the policy through recent years to add to them whenever this can be done without cost to the State.

Through the insufficiency of former appropriations the maps showing lands under water have not been kept up to date. This should be done, so that it may be possible to ascertain at all times just what has been granted.

At present the State Engineer is generally obliged to accept as accurate the maps and reports of engineers in private practice, when application is made for the granting of lands, since no fund is at his disposal to verify these maps or make new ones.

Therefore, I recommend that an appropriation be made for both the keeping of these maps up to date and the making of surveys, when necessary.

In the last annual report of this Department your attention was called to a condition that has existed for some time and has caused much annoyance to some of my predecessors. The State Engineer is intrusted by the Commissioners of the Land Office with the public sale by auction of State lands, including those acquired for unpaid taxes. At these sales men have sometimes been in attendance, seemingly for the purpose of blackmail only, who have extorted money from the former owners by threatening to run up the bids, or have compelled them to pay much more than the unpaid taxes by carrying out their threats.

It was recommended in the last report that this objectionable practice might be stopped by amending the statute which defines the duties of the Commissioners of the Land Office (chapter 317, Laws of 1894), by extending the privilege of redemption up to the time of the public sale, or permitting the prior owner upon application to purchase the property at private sale for an amount which should cover the total expense to the State for such property, including unpaid taxes, interest and costs.

Although these occurrences have been absent during the past year, I desire to state that under the present law the State Engineer is powerless to prevent them, and the condition still exists as a menace to the equitable carrying out of the intent of the law. I would therefore renew the recommendation of last year, that chapter 317, Laws of 1894, be suitably amended.

BUREAU OF BRIDGES.

In former annual reports the fact of the establishment by legislative act of a bureau of bridges and the reasons for such action, have been fully stated. Since the beginning of Barge canal work, this bureau has become a necessary part of that enterprise — in designing not only the bridges but also the lock-gates, lock-valves, needle-dams, movable dams and other steel construction.

The bridges over existing canals in the state often call for expert inspection and this is performed by the bureau of bridges upon request from the Superintendent of Public Works. If repairs are necessary, plans also are furnished by the bureau.

In addition, the bureau has the duty of examining plans submitted by electric and steam railway companies for new bridges over the canals, or for strengthening existing bridges.

The appended report of the Chief Bridge Designer will give in detail the work of the bureau for the year.

STATE BOUNDARY LINES.

The total length of the State boundary lines is 1,416 miles, comprised as follows: Canadian line, 431 miles; Vermont line, 171 miles; Massachusetts line, 50½ miles; Connecticut line to Long Island sound, 81 miles; along the ocean around Long Island to the New Jersey shore, 246 miles; New Jersey line, 92½ miles; Pennsylvania line, 344 miles to the beginning of the Canadian line in the middle of Lake Erie. These boundaries are fixed by accepted agreements and are marked by natural watercourses or by monuments.

When the state boundary lines were last examined by men assigned for the purpose by this Department, it appeared that nearly all of the monuments were in a satisfactory condition, except those along the Connecticut line. The New York-Connecticut division line, from Long Island sound to the southerly boundary of Massachusetts, a distance of about 80 miles, was in dispute for nearly 200 years, or until 1860. Then it was established by a commission, on which the State of New York was represented, and was marked by a hundred marble or iron monuments, but their condition has been unsatisfactory for many years. For some time efforts were made by New York officials to induce the Connecticut authorities to coöperate in remonumenting this line, but without success till two years ago. Then the work of resurveying and remonumenting this line was begun, but the appropriation was insufficient and it was not completed the first year. In response to my request for $10,000 at the last legislative session, only $6,000 was granted, and the work is still unfinished. If one appropriation is large enough to cover the whole cost, such surveys can be made more cheaply than by attempting to do the work in sections. The sum of $6,000 is needed to complete this undertaking.

By chapter 678 of the laws of 1892, the State Engineer and Surveyor is directed to make an examination every three years of all of the monuments marking the boundary lines of the state, and if any monuments are found injured, missing, or displaced, he is authorized — acting in conjunction with the duly recognized authorities of the adjoining State — to replace such monuments. With the exception of the Vermont boundary, none of these lines have been examined within the specified three years, and for most of the lines the inspection is long overdue. Accordingly I recommend an appropriation of $3,000 for this work, in addition to the amount just mentioned for the completion of the Connecticut boundary.

CO-OPERATIVE SURVEY OF STATE.

Survey of New York State in Coöperation with the United States Geological Survey.

Topographic Survey.

During the last decade and a half New York State and the Federal Government have been coöperating in a very important work of surveying and mapping, which is probably but slightly known or appreciated by the general public.

For several years this Department urged the passage of an act to provide for the coöperation of the State of New York with the United States Government for the purpose of securing an accurate topographic survey and map of the State of New York. This recommendation was finally adopted and the work was authorized by law in 1893. The agreement between the United States Geological Survey — the department having the matter in charge for the Federal Government — and the State Engineer's Department, acting on behalf of New York State, is that each shall pay one-half of the expense of the surveys and that the Federal Government shall pay all of the expense of engraving plates and printing the maps therefrom. The State's share of the cost has been provided by annual appropriations by the Legislature, the United States Government contributing an amount equal to the appropriation made by the State.

The importance of this work may be seen when it is stated that probably the cost to the State for these surveys has already been equaled by the amount the maps have been the means of saving. And in this saving, State departments have been the chief beneficiaries. In the work of canal enlargement and reservoir construction, in the improvement of State highways, in the operations of forest reservation, in the investigation for a State system of water-supply, water-storage and power development and in the work of sanitation, the several State Departments make constant use of these maps. They are of great value also to the people of the State in the building of railroads, trolley lines, municipal water-supplies and sanitation and projects for power development.

It is the common practice for engineers planning works of improvement to make their preliminary studies and locations on these maps. Thus all unfeasible schemes and routes are discovered and the necessity for numerous surveys obviated and their cost saved. If more detail is required than the maps afford, only the most favorable locations need be surveyed.

For the purpose of mapping, the state has been divided into 260 quadrangles, each shown on one sheet. The sheets are about 20 inches by 16½ inches in size, and in this state the maps are generally drawn to a scale of about one inch to the mile. The topographic features include cities, villages and individual houses in country districts, roads, trails, railroads, street railroads, tunnels, bridges, ferries, fords, dams, locks, boundary lines, mines, quarries, light-ships, light-houses, life-saving stations, streams, falls, lakes and ponds, canals, aqueducts, marshes, levees, cliffs, sand dunes and contour lines and figures which give the elevations of all territory referred to sea-level. Some of the later maps show also the wooded portions. As no other map of the state has ever been published with so large a scale nor in such detail, and as the total cost of the work is only about $13 per square mile, it will be seen that the State is securing a most valuable acquisition at less than half its actual and extremely low cost, the expense to the State thus far having really been less than $6 per square mile. The price of the finished maps to individuals is merely nominal — five cents apiece in lots of less than a hundred and three cents each in quantities of one hundred or more. Many people have availed themselves of the opportunity and have purchased these sheets to use simply as reference maps.

In 1905 the State Legislature failed to appropriate the customary sum of $30,000 for the coöperative survey and during the year the Federal Government transferred a portion of its available funds to work in other states. Upon the resumption of appropriations by the State in 1906, it was found that only about $10,000 remained available as the share of the United States to continue the work.

The survey in this state is nearing completion. It is estimated that it can be finished in three years, if New York will appropriate $25,000 annually for these years and if the United States Government will meet these appropriations with a like amount. One of our Federal Senators has given assurance that he will urge our claims, if the State will make this appropriation. I therefore recommend that the Legislature appropriate $25,000 at the coming session, in order that the National Government may be induced to furnish a similar sum and hasten the work in this state. Large demands for these surveys are being made upon the Government by other states and still larger demands will be made in the future. It seems unwise for the Legislature longer to defer adequate provision for so important a work. Rather it should return to its former policy, that the State may reap the full benefit of completed surveys before the demands of other localities become still greater on the United States Government and operations here are yet further delayed.

HYDROGRAPHIC SURVEY.

Since 1900 there has existed a coöperative agreement between New York State and the United States Government to engage in making measurements of the volume of streams and the flow of water therein, each bearing one-half of the expense. With the exception of 1905 this work has been carried on jointly. In 1905 the State failed to make the usual appropriation and the United States Government assumed the whole expense, but discontinued several of the gaging stations which had been maintained chiefly for the benefit of the State. In that year no report of the gagings was made to this Department, but through the courtesy of the Director of the United States Geological Survey certain portions of the Government report were reprinted, so as to preserve the continuity of the State reports on stream gaging. In 1906 a Bureau of Hydraulics was organized in connection with the Barge canal office. It had been the original intention to cover the entire state, including all important streams, by gagings made on the coöperative basis. The necessity for extensive and detailed studies on certain streams along the line of the Barge canal made it desirable that a portion of the work formerly conducted on the coöperative basis should be taken over by this Department, the coöperative fund being insufficient to carry on this work to the full extent necessary. Accordingly in 1906 all the gaging stations formerly maintained on the coöperative basis in the Hudson, Mohawk, Oneida, Seneca and Oswego river basins were transferred to the Barge canal office and subsequently have been maintained by this office. This leaves the entire coöperative fund available for work on outlying streams. There are at present about 25 coöperative gaging stations maintained. Most of these stations were established early in the coöperative work, so that the records are already of sufficient duration to be of much value and their value is increasing as their length increases.

A drought of unusual severity has prevailed over the entire state during the summer and fall seasons of 1908 and 1909. This condition has enabled low-water flows to be determined with greater certainty than heretofore. The records of gaging of streams over the entire state are of value in connection with the work on the Barge canal. Gagings made away from the immediate line of the canal often afford available data by comparison with other records. In addition, experience has shown that this data is of public use in a wide variety of ways. Attention is being called to the possibility of extension of the navigable waterways of the state. Data regarding the yield of the streams is fundamental to such studies and provision should be made for the continuation of all of the stream gaging work during the coming year.

FURTHER RECOMMENDATIONS.

In addition to the matters to which, under their respective headings, I have already called your attention, as needing legislative action, I desire to bring to the notice of your honorable body seven important subjects that deserve suitable legislation.

The first concerns the streams of New York state, which, because of actual usage from early times or by legislative act, or both, have become navigable public highways.

It is doubtful if there is any general realization of the number and extent of these streams over which the State is sovereign and retains control for navigation purposes. The development of this extensive system has been gradual and has been carried on in piece-meal fashion.

The navigable streams of the Hudson river basin includes not only the Hudson river itself, but a number of its important tributaries, as, for example, the Schroon river, the Mohawk and the Wallkill. In the Delaware river basin, the east and west branches of the Delaware river and the Beaverkill are public highways; in the Susquehanna river basin, the Susquehanna, Chenango, Chemung, Canisteo and Tioga rivers and smaller streams; in the Genesee river basin, the Genesee river, Black creek, Oatka creek and Canaseraga creek. So also in the Allegheny river basin the principal streams are public highways, as is also the case of the Black river, the Oswegatchie river, portions of the Grasse, Racquette, St. Regis and Salmon rivers, the Saranac river, Lake Champlain and Wood creek. So also is the entire system of Central or Finger lakes, with their outlets and most of their tributaries. Numerous other rivers and streams in the State, which I need not name, will also be found to be included in this list, making a grand total of 1,800 miles.

In many instances more or less public money has been expended at one time or another to improve navigation, but as a rule, except on streams forming part of the present canal system, there is no State official or department having general or official charge of these numerous waterways. It would seem appropriate at this time to take steps looking both toward a better understanding of the navigable waterways of the state and also toward the inspection, protection and better utilization of these waterways, which are the properties of the State.

Under present conditions there is a strong tendency toward the usurpation of the streams of the state for private purposes, including power development, water-supplies and the like. These objects, while eminently worthy, should never be permitted to interfere with the preëminent right of the State for purposes of navigation. Without doubt the State has frequently been compelled to pay for rights previously purchased or never having legally passed from its possession, for the term "vested rights" has become one to juggle with by claimants for damages and the State has suffered through a lack of accurate information concerning the rightful possession of its waterways.

Therefore, I recommend, in order that intelligent progress may be made in the development of additional waterways and before other rights are usurped or existing usurpations are strengthened through lapse of time, that proper legislative provision be made for instituting a broad investigation of the whole subject, which should include:

(1) A compilation of the history of all important navigable streams.

(2) A general engineering reconnaissance, to determine the characteristics of the streams and the steps, if any, which may best be taken, looking toward their development, together with a study of the probable utility of greater navigation facilities.

Perhaps of second importance is the crying need for fire-proof depositories for the valuable maps and records now on file and constantly accumulating in the several offices of the State Engineer's Department. None of these offices are in fire-proof buildings nor has any of them a fire-proof vault. The records are not insured, nor can they be, since money cannot replace them nor compensate for their loss. They are of inestimable value and much depends upon their preservation. As evidence before the courts, especially in defending suits in the Court of Claims, as records of state lands, as references for settling both public and adjacent private property line disputes, as data for fixing state and county boundary lines and state property lines and as accounts of the millions of dollars' worth of work done upon public improvements, these papers imperatively demand proper care, before some catastrophe renders their replacement impossible and causes a loss to the State many times the cost of proper housing.

Accordingly I recommend an appropriation for building fire-proof vaults or erecting a fire-proof building, if necessary. The offices of the State Engineer and of the Division Engineers of the

Eastern and Middle Divisions are in State buildings. Probably fire-proof vaults would answer the demands in these offices. The Western Division Engineer is quartered in a rented office. He needs the erection of a suitable fire-proof building or the remodeling of the weigh-lock building in Rochester, so as to accommodate both the Division Engineer and the Assistant Superintendent of Public Works, who now occupies it.

The next item is also very important. Before any portion of the existing canals is superseded by a new location of the enlarged channel, the "blue line" should be surveyed and monumented. The State owns much valuable property enclosed within these lines. Also the deeds of many adjacent properties base their descriptions on the blue line as a starting point. Should the canal lines and structures be obliterated, it would be almost impossible to retrace the blue line upon the ground from the data given on canal maps, and not only would an endless amount of trouble ensue, but, without doubt, the State would thus lose valuable rights and possessions. I, therefore, recommend an appropriation for this purpose.

I think that statutory provision should be made directing the State Engineer to make all necessary surveys for State departments and commissions which have no engineering corps of their own. Occasionally such surveys have been made by this Department upon the request of certain commissions, but no law governs these cases. During the past year four surveys of this character have been made, two for the Lunacy Commission and one each for the Prison Commission and the Saratoga Reservation Commission.

From the nature of his duties it seems both natural and proper that the State Engineer should make these surveys. In fact such work constitutes one of the reasons for the existence of his office. Moreover, he can generally make them more economically and more speedily than can engineers in private practice, who would be compelled to form an organization for this special purpose, while the State Engineer's force is already well organized. It may be noted that one of the surveys made for the Lunacy Commission during the past year — that at Ward's Island — cost only $1,163, while the bids by private engineers for doing the same work ranged from $1,700 to $20,000, and averaged $5,895.

In line with this same subject I have another recommendation to make, namely, that a fund of at least $5,000 should be placed in the hands of the Comptroller, which might be drawn upon temporarily to carry on these surveys — to be refunded later by the department or commission for which the survey is made. It sometimes happens that the survey must be made before the fund to pay for it is available, either because a commission is created under a provision to raise money by bond sale or for some other reason, and to attempt to do the work under such conditions, results only in delays and inconvenience to all concerned.

At Little Falls there exist two historical relics of no mean value — a canal lock and nearby stone bridge — built by the Western Inland Lock Navigation Company, which was chartered by the State in 1792 to open navigation westerly across the State and whose works were the forerunners of the State canal, which nearly a half century later joined the great inland lakes and the ocean and brought growth and prosperity to our State and the possibility of development to the interior commonwealths.

The chartering of this company marked the beginning of a very *important* epoch in our nation's history and that any of its structural works should still exist after this lapse of time and during such universal changes is both remarkable and fortunate. The Legislature of 1883 performed a most patriotic duty when by act (chapter 448) it declared that these relics of the early internal improvements of the State should be preserved and dedicated to public use, naming the State Engineer and Surveyor and the Commissioners of Public Grounds in Little Falls as their custodians. *It is* a duty to ourselves as well as to posterity that such as remain of the fast disappearing relics of our early history should be kept for the education of the present and future generations.

The lock walls are gradually falling down, but the destruction may be checked, if proper precautions are taken. As no fund is available, I recommend the appropriation of $1,000 for this purpose.

The other recommendation is in regard to a subject which affects all State departments. I think that the Civil Service Law should be amended so as to provide that the Civil Service Commission or some judicial tribunal should hear the cases of veterans and exempt firemen, against whom charges of inefficiency or misconduct are brought. It is very embarrassing and manifestly unfair to both parties to place the head of a department in the position of being at the same time accuser and judge.

CONCLUSION.

To assist me in supervising the work of this Department (which has been in my charge during the calendar year 1909, but not the whole of the fiscal year covered by this report), I have had Mr. Harry W. DeGraff as Deputy State Engineer and Mr. William B. Landreth as Special Deputy State Engineer, to the former having been assigned an oversight of work other than Barge canal construction, while the latter has supervised Barge canal work. Since assuming office, I have made several changes in the organization of the force and in the duties of various members, which have resulted in great benefit to the whole work of the Department.

The appended tables will show the engineering expenses during the fiscal year and all contracts that have been or are in force. The appended reports of the Division Engineers and of the heads of various bureaus will show in detail the work and expenses of the Department, as well as give a record of some of the data obtained.

For carrying on the great undertakings entrusted to me, I must have a large corps of assistants and upon their efficiency and faithfulness I must largely depend for the successful administration of my office. In closing this report I wish to express to them my appreciation and thanks for the manner in which they have done their work. I desire also to acknowledge with gratitude the courteous assistance of the various State officials, the members of the Legislature and others with whom I have been associated in performing my duties.

Respectfully submitted,
FRANK M. WILLIAMS,
State Engineer and Surveyor.

Engineering Expenses for the Fiscal Year Ended September 30, 1909

Table of Contracts Completed During the Fiscal Year Ended September 30, 1909

Table of Contracts Pending February 17, 1909 (Improvement of Public Highways)

Table of Contracts Pending September 30, 1909

Engineering Expenses for Fiscal Year Ended September 30, 1909.

Ordinary Repairs to Canals.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Erie canal	465	1908	Eastern	$8,012 38	$12,000 00
Champlain canal	465	1908	Eastern	3,987 62	
Erie canal	465	1908	Middle	$8,414 76	9,000 00
Cayuga and Seneca canal	465	1908	Middle	420 61	
Black River canal	465	1908	Middle	164 63	
Erie canal	465	1908	Western	$8,408 36	8,408 36
Total	.....	......	....	....	$29,408 36

Construction of Barge Canal.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Barge canal, head office account	147 143 172 195	1903 1905 1907 1909	Eastern	$286,624 58	$561,565 86
Erie	147 143 172 195	1903 1905 1907 1909	Eastern	178,638 25	
Champlain	147 143 172 195	1903 1905 1907 1909	Eastern	96,303 03	
Barge canal, Erie	147	1903	Middle	$116,846 39	158,667 82
Oswego	147	1903	Middle	41,821 43	
Barge canal, Erie	147	1903	Western	$186,398 08	186,398 08
Total	.....	......	....	....	$906,631 76

Improvement of Public Highways.

(From October 1, 1908, to February 17, 1909.)

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Highway improvement........	115	1898	Eastern...	$164,015 70	
Maintenance and repairs.......	115 468 686 170 229	1898 1906 1906 1907 1908	Eastern...	27,974 80	
					$191,990 50
Highway improvement........	115	1898	Middle....	$70,797 32	
Maintenance and repairs.......	115 686	1898 1906	Middle....	23,535 88	
					94,333 20
Highway improvement........	115	1898	Western...	$39,731 63	
					39,731 63
Total....................	.....	......	....	....	$346,055 33
" Money System," repair of highways....................	700 686 577	1905 1906 1907	Eastern...	$20,517 64	
					$20,517 64

Special Work.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Mill street bridge, Cazenovia...	281	1908	Middle....	$600 00	
Ovid street bridge, Seneca Falls.	273	1908	Middle....	299 97	
North Salina street bridge, Syracuse........................	668	1906	Middle	132 18	
Seneca street bridge, Utica	454	1909	Middle..	812 34	
Durhamville aqueduct.........	672	1908	Middle..	135 51	
					$1,980 00
Allen street bridge, Rochester...	291	1908	Western.	$3,946 60	
Lyell avenue bridge, Rochester.	287	1908	Western ..	4,080 22	
					8,026 82
Total....................	.....	......	....	......	$10,006 82

Bureau of Bridges.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Bureau of bridges.............	686 578 466 433	1906 1907 1908 1909	Eastern...	$1,320 33	
Total....................	.....	......	....	....	$1,320 33

Special Surveys.

WORK.	ACT.		Division.	Amount.	Total.
	Chap.	Year.			
Examination of monuments and maps	729 686 466 433	1904 1906 1908 1909	Eastern	$6,671 39	
Court of Claims surveys	686 578	1906 1907	Eastern	1,372 28	
Mohawk street bridge, Waterford	265	1908	Eastern	670 38	
Cayuga and Seneca canal	433	1909	Eastern	3,902 11	
Topographic survey	686 466 433	1906 1908 1909	Eastern	11,212 59	
Hydrographic survey	686 466 433	1906 1908 1909	Eastern	1,874 61	$25,703 36
Cayuga and Seneca canal	433	1909	Middle	$2,264 53	
Court of Claims surveys	466	1908	Middle	2,598 91	4,863 44
Court of Claims surveys	568	1907	Western	$346 74	
Georgia street bridge, Buffalo	452	1909	Western	413 70	
Dresden boat landing and pier	266	1908	Western	10 89	
Lighthouse, Keuka lake outlet	266	1908	Western	4 57	775 90
Total	.....	......	....	....	$31,342 70

Summary of Engineering Expenses for Fiscal Year Ended September 30, 1909.

DIVISION.	Ordinary repairs to canals.	Construction of Barge canal.	Improvement of public highways.	Money system.	Special work.	Bureau of bridges.	Special surveys.	Total.
Eastern	$12,000 00	$561,565 86	$191,990 50	$20,517 64	....	$1,320 33	$25,703 36	$813,097 69
Middle	9,000 00	158,667 82	94,333 20	....	$1,980 00	....	4,863 44	268,844 46
Western	8,408 36	186,398 08	39,731 63	....	8,026 82	....	775 90	243,340 79
Totals	$29,408 36	$906,631 76	$326,055 33	$20,517 64	$10,006 82	$1,320 33	$31,342 70	$1,325,282 94

TABLE OF CONTRACTS COMPLETED DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1909.

CONTRACTOR.	Date of contract.	Character of work.	Division.	ACT.		Appropriation.	Contract price.	Final payment.
				Chap.	Year.			
John M. Shultz	Jan. 15, 1907	Constructing a lift bridge over the Oswego canal at North Salina street, Syracuse	Middle	668	1906	*$75,000 00	$65,686 00	$68,434 73
John Young and Patrick J. Cawley	July 8, 1908	Constructing a protection wall on the west side of Skaneateles lake outlet	Middle	675 400 394	1906 1907 1908	15,000 00	11,893 00	11,444 60
Montour Steel Co.	Dec. 20, 1908	Constructing a plate girder bridge over the outlet of Cazenovia lake at Mill street, Cazenovia, Madison county	Middle	281	1908	6,000 00	4,041 50	4,011 20
W. J. Burns Co.	Dec. 16, 1908	Lyell avenue bridge, Rochester	Western	287	1908	55,000 00	30,970 40	31,336 64

* $31,250 appropriated by the city of Syracuse and $12,500 by Syracuse Rapid Transit Railway

Construction of Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
M. Fitzgerald	Aug. 8, 1906	Contract No. 34, Erie canal — Highway bridge at Saratoga avenue, Waterford	Eastern	$22,604 00	$22,449 00	$22,316 90

Improvement of Public Highways.

Chapter 115, Laws of 1898, and amendatory laws.
(Completed between October 1, 1908, and February 17, 1909.)

CONTRACTOR.	Date of contract.	Character of work.	Division.	Contract price.	Final payment.
Mansfield & Burton	Jan. 20, 1908	Craigville, undergrade crossing road. No. 154-B. Orange county	Eastern	$15,086 00	$16,192 00
James E. Martin	July 5, 1906	Poughkeepsie–Pleasant Valley road, No. 549, Dutchess county	Eastern	*49,773 15	†65,439 29
John Weber & Sons, Inc	Dec. 31, 1906	Cortland–Homer road, No. 208, Cortland county	Middle	7,545 00	7,492 15
Celestin C. Burns	July 2, 1906	Adams–Henderson (section 2) road, No. 234, Jefferson county	Middle	45,176 00	56,160 81
Casey & Murray	Sept. 15, 1906	Utica–Oneida Castle (section 1) road, No. 271, Oneida county	Middle	79,800 00	93,224 18
Chambers & Grady	Dec. 4, 1907	Seneca River road–North Side, No. 273, Seneca county	Middle	15,880 50	15,180 43
County of Broome	July 12, 1906	Union–Maine road, No. 275, Broome county	Middle	30,604 00	30,160 32
Stewart–Kerbaugh–Shanley Company	Sept. 20, 1907	Syracuse–Watertown road, No. 278, Oswego county	Middle	23,475 80	23,217 76
Stewart–Kerbaugh–Shanley Company	Sept. 20, 1907	West Oswego River road, No. 279, Oswego county	Middle	25,423 25	24,075 85
Stewart–Kerbaugh–Shanley Company	Sept. 20, 1907	Skaneateles–Hamilton road, No. 330, Onondaga county	Middle	27,093 00	23,995 34
County of Tompkins	Aug. 30, 1906	Cayuga Heights road, No. 336, Tompkins county	Middle	33,182 00	32,147 75
Stewart–Kerbaugh–Shanley Company	Sept. 20, 1907	Syracuse turnpike, No. 337, Madison county	Middle	12,525 30	12,104 92
County of Tompkins	Aug. 30, 1908	Catskill turnpike (section 2) road, No. 338, Tompkins county	Middle	13,111 00	13,279 75
William I. Tyler	Sept. 18, 1906	Georgetown road, No. 339, Madison county	Middle	27,487 50	27,395 74
John H. Gordon	Nov. 23, 1906	Augusta road, Augusta section, No. 368, Oneida county	Middle	34,500 00	34,248 22
County of Broome	July 12, 1906	Maine road, No. 374, Broome county	Middle	32,902 60	32,879 21
John Weber & Sons, Inc	Sept. 19, 1906	Harford road, No. 379, Cortland county	Middle	6,868 00	6,758 70
Mott & Kemper	Nov. 14, 1906	State road, Homer, No. 380, Cortland county	Middle	37,300 00	37,740 79
Scofield Company & M. F. Dollard	Nov. 10, 1906	Fleming road, No. 384, Cayuga county	Middle	28,250 00	28,135 07
County of Broome	July 12, 1906	Vestal road, No. 420, Broome county	Middle	35,287 18	35,338 23
Casey & Murray	Dec. 2, 1907	Conklin road, No. 421, Broome county	Middle	80,191 25	79,930 09
William J. Semper	Mar. 23, 1908	State (section 2) road, No. 426, Jefferson county	Middle	45,330 50	43,406 36
Stewart–Kerbaugh–Shanley Company	Dec. 8, 1907	Watertown–Carthage (section 3) road, No. 428 Jefferson county	Middle	32,047 55	30,431 84
J. Charles Dayton	July 20, 1906	Skaneateles–Spafford road, No. 431, Onondaga county	Middle	25,997 00	26,773 37
M. F. Dollard	Aug. 29, 1906	Augusta road (Lowell and Spencer sections), No. 438, Oneida Co	Middle	66,666 00	78,201 05
Joseph McCormick	Dec. 20, 1907	Lisle–Center Lisle road, No. 445, Broome county	Middle	31,362 45	30,898 27
County of Tompkins	Aug. 30, 1906	Wyckoff road, No. 455, Tompkins county	Middle	3,851 25	3,543 15
John Young	Nov. 10, 1906	Skaneateles West Lake (sections 1, 2 and 3) road, No. 486, Onondaga county	Middle	31,994 00	31,237 43
Daniel V. Brown	Nov. 10, 1906	Elbridge road, No. 487, Onondaga county	Middle	36,487 00	36,445 92
John Weber & Sons, Inc	July 10, 1906	Homer–Tully (section 1) road, No. 510, Cortland county	Middle	25,770 00	24,275 70
Casey & Murray	Sept. 19, 1907	Utica–Bridgewater road, No. 559, Oneida county	Middle	76,347 00	93,839 51
Casey & Murray	Sept. 19, 1907	Mohawk River road, Rome, No. 560, Oneida county	Middle	23,406 70	22,256 99
Brown & Lowe	Jan. 29, 1908	Rome–Northwestern (section 1) road, No. 561, Oneida county	Middle	46,000 47	58,800 25
Scofield Co. and Fred. T. Ley & Co	Nov. 10, 1908	Auburn–Seneca Falls (section 1) road, No. 590, Cayuga county	Middle	69,660 00	....
Jeremiah T. Finch	Nov. 15, 1906	Moravia–Niles road, No. 591, Cayuga county	Middle	82,392 00	82,156 99
Chambers & Grady	Sept. 18, 1906	Auburn–Elbridge road, No. 592, Cayuga county	Middle	47,000 00	48,006 43

* Exclusive of special agreements.

† Final payment pending.

Table of Contracts Completed During the Fiscal Year Ended September 30, 1909 — (Concluded).

Improvement of Public Highways — (Concluded).

CONTRACTOR.	Date of contract.	Character of work.	Division.	Contract price.	Final payment.
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Norwich-South New Berlin (section 1) road, No. 596, Chenango county	Middle	$32,988 50	$32,279 90
Newport Construction Company	Oct. 22, 1907	Norwich-Kings Settlement road, No. 597, Chenango county	Middle	33,127 25	32,465 05
Stewart-Kerbaugh-Shanley Company	Dec. 14, 1907	Norwich-Preston road, No. 598, Chenango county	Middle	52,664 60	52,598 05
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Cayuga Heights-Hanshaw Cor's road, No. 606, Tompkins county	Middle	21,511 75	20,819 03
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Trumansburg-Ithaca road, No. 616, Tompkins county	Middle	88,439 60	97,643 26
Stewart-Kerbaugh-Shanley Company	Dec. 18, 1907	Granby road, No. 653, Oswego county	Middle	57,586 00	56,946 64
Stewart-Kerbaugh-Shanley Company	Feb. 11, 1908	Chittenango-Oneida (section 2) road, No. 726, Madison county	Middle	77,721 10	77,723 81
Frederick A. Brotsch	July 11, 1906	Chili (section 1) road, No. 254, Monroe county	Western	19,400 00	26,667 63
Frederick A. Brotsch	July 11, 1906	Chili (section 2) road, No. 255, Monroe county	Western	16,070 00	20,808 54
Monroe Roads Company	Sept. 17, 1907	Clover street (section 1) road, No. 294, Monroe county	Western	40,475 34	40,895 61
Bennett & Ryan	Mar. 9, 1908	Wellsburg road, No. 355, Chemung county	Western	54,176 85	54,396 73
Casey & Murray	Dec. 2, 1907	Horseheads-Corning road, No. 358, Chemung county	Western	77,954 40	77,159 39
Gantz-Wilson Construction Company	July 18, 1906	Clinton street (section 1) road, No. 371, Erie county	Western	45,925 00	153,996 03
Gantz-Wilson Construction Company	July 18, 1906	Clinton street (section 2) road, No. 372, Erie county	Western	52,995 00	119,578 04
Baldwin Construction Company	July 9, 1906	Goodrich road, No. 373, Erie county	Western	69,197 00	73,001 56
Thomas Hucknell	Aug. 31, 1906	Five Corners-Kuckville (section 2) road, No. 387, Orleans county	Western	36,935 00	37,162 38
Jeremiah T. Finch	Sept. 19, 1907	Latta road, No. 399, Monroe County	Western	72,004 95	78,077 22
Greece Construction Company	Dec. 4, 1907	Buffalo (section 3) road, No. 402, Monroe county	Western	24,805 65	26,145 92
Rockefeller Brothers	Nov. 26, 1907	Churchville-Riga road, No. 403, Monroe county	Western	17,412 60	19,602 53
A. J. Rockwood	Nov. 26, 1907	Clover street (section 2) road, No. 474, Monroe county	Western	14,695 55	16,899 26
Henry P. Burgard Company	Jan. 20, 1908	West Bloomfield-Honeoye Falls road, No. 485, Ontario county	Western	30,000 00	30,149 46
Moser & Summers	Sept. 17, 1907	North Collins-Lawton road, No. 524, Erie county	Western	64,585 65	65,857 26
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Lawton-Gowanda road, No. 525, Erie county	Western	44,446 80	35,726 95
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Alden-Town line, Clinton street-Marilla road, No. 529, Erie county	Western	45,596 90	45,327 77
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Base Line-Grand Island (section 1) road, No. 530, Erie county	Western	13,077 55	12,911 93
Stewart-Kerbaugh-Shanley Company	Dec. 18, 1907	Base Line-Grand Island (section 2) road, No. 531, Erie county	Western	18,194 65	17,766 00
Stewart-Kerbaugh-Shanley Company	Dec. 18, 1907	Base Line-Grand Island (section 3) road, No. 532, Erie county	Western	10,425 35	10,199 03
Henry P. Burgard Company	May 7, 1908	Skinnersville-New Home Bridge road, No. 584, Erie county	Western	76,010 70	85,533 71
Gantz-Wilson Construction Company	Sept. 24, 1907	Olean-Allegany (sections 1 and 2) road, No. 601, Cattaraugus county	Western	35,963 10	31,349 95
Gantz-Wilson Construction Company	Dec. 18, 1907	Manchester-Clifton Springs road, No. 607, Ontario County	Western	26,503 25	26,438 87
Gantz-Wilson Construction Company	Dec. 18, 1907	Phelps-Clifton Springs road, No. 608, Ontario county	Western	14,977 08	14,670 16
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Lewiston-Dickersonville road, No. 617, Niagara county	Western	32,330 35	32,048 23
Stewart-Kerbaugh-Shanley Company	Dec. 18, 1907	North Tonawanda-Sanborn road, No. 643, Niagara county	Western	39,839 40	38,899 63
E. M. Love & Son	Feb. 5, 1908	Falconer-Kennedy road, No. 698, Chautauqua county	Western	9,845 70	9,115 95
Star Construction Company	Jan. 30, 1908	Portville-Olean (section 2) road, No. 731, Cattaraugus County	Western	19,619 50	20,994 02
Bradley & Nolan	Jan. 30, 1908	Big Flats-Gibson road, No. 742, Steuben county	Western	48,185 43	49,706 33

TABLE OF CONTRACTS PENDING FEBRUARY 17, 1909.

Improvement of Public Highways.

Chapter 115, Laws of 1898; chapter 468, Laws of 1906, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	*Contract price, plus special agreements.	Payments to February 17, 1909.
Robert Schafer	July 12, 1906	Lake Pleasant-Speculator road, No. 277, Hamilton county	Eastern	$33,900 00	$25,814 20	$15,970 51
Shanley-Morrissey, Inc.	Sept. 20, 1907	Sprakers-Rural Grove road, No. 304, Montgomery county	Eastern	59,600 00	54,834 25	21,374 97
Shanley-Morrissey, Inc.	Dec. 18, 1907	Canajoharie-Sprout Brook road, No. 345, Montgomery county	Eastern	41,900 00	38,610 70	23,026 35
Central & Eastern Construction Co.	Nov. 12, 1908	Sprakers-Rural Grove (section 2) road, No. 346, Montgomery county	Eastern	18,100 00	15,722 60	....
Joseph Walker	Nov. 12, 1908	Canajoharie-Sharon Springs (section 2) road, No. 347, Montgomery county	Eastern	29,350 00	25,278 25	....
Elmore & Hamilton Construction Co.	Dec. 2, 1907	West Point-Cornwall road, No. 411, Orange county	Eastern	225,000 00	187,635 00	1,373 31
DeGraff & Hogeboom	Nov. 17, 1908	Port Jervis-Sullivan county line (section 1) road, No. 412, Orange county	Eastern	32,750 00	55,400 65	....
DeGraff & Hogeboom	Nov. 17, 1908	Hyland Mills-Monroe road, No. 413, Orange county	Eastern	18,400 00	30,410 00	....
Morris Kantrowitz	Sept. 19, 1907	Saratoga-Gansevoort road, No. 442, Saratoga county	Eastern	45,700 00	37,984 50	21,229 83
Spuyten Duyvil Construction Co.	Dec. 2, 1907	Old Forge-McKeever road, No. 462, Herkimer county	Eastern	126,410 00	114,610 65	24,969 96
Bellew & Merritt	Dec. 3, 1908	Manheim-Center Salisbury road, No. 463, Herkimer county	Eastern	56,200 00	61,734 75	....
Rockefeller Bros.	Nov. 12, 1908	Salisbury Center-Stratford road, No. 464, Herkimer county	Eastern	44,600 00	38,839 00	....
Thomas H. Karr	Nov. 12, 1908	Troy-Speigeltown road, No. 504, Rensselaer county	Eastern	16,450 00	14,244 75	....
Rockefeller Bros.	Nov. 12, 1906	Schodack Center-Nassau road, No. 536, Rensselaer county	Eastern	51,100 00	43,895 05	....
Shanley-Morrissey, Inc.	Jan. 30, 1908	Mayfield-Northville (section 2) road, No. 541, Fulton county	Eastern	60,150 00	49,773 15	18,890 10
S. B. Van Wagenen	Nov. 17, 1908	Johnstown-Broadalbin (section 2) road, No. 543, Fulton conuty	Eastern	49,850 00	41,679 90	....

* Contract price for all roads on Middle Division does not include special agreements.

TABLE OF CONTRACTS PENDING FEBRUARY 17, 1909 — (Continued).

Improvement of Public Highways — (Continued).

Chapter 115, Laws of 1898; chapter 468, Laws of 1906, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	*Contract price, plus special agreements.	Payments to February 17 1909.
Long Island Contracting & Supply Co.	Nov. 12, 1908	Willets–East Williston–Westbury Pond road, No. 547, Nassau county	Eastern	$63,500 00	$63,189 80	
Shanley-Morrissey, Inc.	Sept. 20, 1907	Carmel–Kent road, No. 570, Putnam county	Eastern	55,650 00	64,137 67	$44,141 98
Thomas H. Karr	Nov. 13, 1908	Spring Ave., Troy–Poestenkill road, No. 571, Rensselaer county	Eastern	24,575 00	20,323 50	
Harvey B. Sproul	Nov. 13, 1908	Towners Corners–County line road, No. 585, Putnam county	Eastern	45,200 00	36,840 75	
John Harrigan	Nov. 13, 1908	Troy–Schenectady (section 3) road, No. 604, Albany county	Eastern	40,500 00	27,696 90	
John E. Consalus	Nov. 13, 1908	Wicopee–Beekman road, No. 627, Dutchess county	Eastern	77,500 00	56,473 65	
Jos. Walker	Nov. 13, 1908	Pawling-Dover Town Line road, No. 612, Dutchess county	Eastern	32,100 00	29,323 00	
Malloy & Davis	Nov. 13, 1908	Troy–Schenectady (section 4) road, No. 630, Albany county	Eastern	24,900 00	19,330 75	
Jos. Walker	Nov. 13, 1908	Indian Fields–Dormansville road, No. 646, Albany county	Eastern	46,800 00	32,851 75	
Jos. Walker	Nov. 13, 1908	Hudson–Hollowville road, No. 650, Columbia county	Eastern	68,400 00	56,317 40	
W. B. Spellman	Nov. 13, 1908	Champlain–Perrys Mills road, No. 652, Clinton county	Eastern	27,500 00	22,107 75	
J. K. Palmer	Nov. 27, 1907	Milford Center–Milford road, No. 674, Otsego county	Eastern	75,800 00	71,067 88	43,322 64
J. K. Palmer	Nov. 27, 1907	Otego–Oneonta road, No. 675, Otsego county	Eastern	52,800 00	46,657 86	15,912 64
Delaware Construction Co.	Feb. 4, 1908	Edmonston–West Burlington–Kelsey Corners road, No. 677, Otsego county	Eastern	43,900 00	42,815 39	20,677 46
John E. Consalus	Nov. 13, 1908	Monsey–Egypt Corners road, No. 690, Rockland county	Eastern	46,800 00	28,474 70	
Spuyten Duyvil Construction Co.	Jan. 23, 1908	Malone–Ft. Covington (section 2) road, No. 702, Franklin county	Eastern	53,900 00	43,229 00	16,848 72
John Harrigan	Nov. 21, 1908	Sidney–Unadilla road, No. 708, Otsego county	Eastern	52,100 00	35,541 50	
John E. Consalus	Feb. 11, 1908	Greenville–Coxsackie (section 2) road, No. 719, Greene county	Eastern	52,600 00	42,338 80	31,139 44
Putnam & Hare	Nov. 14, 1908	Whitehall–Ft. Ann Town Line road, No. 723, Washington county	Eastern	46,000 00	31,609 40	

Shanley-Morrissey, Inc.	Nov. 14, 1908	North Creek-County Line road, No. 736, Warren county	Eastern	37,500 00	26,104 60	....
P. F. Herlihy	May 18, 1908	Taylor-Schroon Lake village road, No. 745, Essex county	Eastern	60,200 00	53,757 35	4,100 45
John F. Creeden	Dec. 5, 1908	Delhi-Bloomville road, No. 747, Delaware county	Eastern	77,100 00	66,027 40	....
Santonini Construction Co	May 18, 1908	Aiden Lair-Newcomb (section 2) road, No. 756, Essex county	Eastern	71,400 00	85,361 15	42,859 44
Decicco Contracting Co.	Nov. 20, 1908	Ossining-Kitchawan road, No. 768, Westchester county	Eastern	68,600 00	44,698 50	....
Decicco Contracting Co.	Nov. 20, 1908	Amawalk-Woods Bridge road, No. 769, Westchester county	Eastern	44,600 00	27,297 00	....
Decicco Contracting Co.	Nov. 20, 1908	Goldens Bridge-Turk Hill road, No. 770, Westchester county	Eastern	42,300 00	26,882 50	....
Malloy & Davis	Nov. 14, 1908	Richfield Springs-Schuyler Lake road, No. 784, Otsego county	Eastern	43,400 00	31,430 90	....
Malloy & Davis	Nov. 14, 1908	South Schenectady-Moriaville road, No. 788, Schenectady county	Eastern	82,800 00	64,226 70	....
Henry J. Mullen	Nov. 14, 1908	Huntington-Amityville road, No. 794, Suffolk county	Eastern	125,300 00	87,376 10	....
Bellew & Merritt	Nov. 20, 1908	Jeffersonville-Kenoza Lake-Fosterdale road, No. 795, Sullivan county	Eastern	71,900 00	49,903 50	
Thomas O'Hearn	Nov. 14, 1908	Greenville-Coxsackie (section 1) road, No. 796, Greene county	Eastern	50,700 00	36,825 35	....
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Redwood-Alexandria Bay (section 2) road, No. 236, Jefferson county	Middle	38,200 00	35,467 20	25,930 50
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Coleman Hill (section 1) road, No. 245, Onondaga county	Middle	15,600 00	14,716 45	12,511 40
C. H. Quereau Co., Inc	July 10, 1906	West Lake (section 2) road, No. 292, Onondaga county	Middle	10,550 00	9,350 00	7,911 31
C. H. Quereau Co., Inc	July 10, 1906	East Lake (section 2) road, No. 293, Onondaga county	Middle	9,500 00	8,750 00	8,074 53
Henry C. Schroeder	Sept. 18, 1907	Reservation road, Fayette, No. 320, Seneca county	Middle	50,500 00	45,743 15	30,306 14
Wm. J. Dwyer	July 9, 1906	Collamer road, No. 348, Onondaga county	Middle	20,400 00	18,000 00	17,834 41
John Weber & Sons, Inc	July 10, 1906	McGrawville road, No. 378, Cortland county	Middle	30,750 00	26,661 00	25,370 20
Stewart-Kerbaugh-Shanley Co	Sept. 20, 1907	State road-Scott, No. 381, Cortland county	Middle	27,300 00	26,475 75	....
Stewart-Kerbaugh-Shanley Co	Sept. 20, 1907	Watertown-Theresa (section 3) road, No. 423, Jefferson county	Middle	40,350 00	39,419 85	7,232 08
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Phoenix-Pennellville road, No. 450, Oswego county	Middle	21,550 00	18,787 50	1,495 03
Stewart-Kerbaugh-Shanley Co.	Jan. 14, 1908	Minetta-Fulton road, No. 451, Oswego county	Middle	24,300 00	21,561 50	....
Wm. J. Dwyer	July 9, 1906	Cicero-South Bay road, No. 452, Onondaga county	Middle	33,100 00	28,937 95	12,348 76
County of Tompkins	Aug. 30, 1906	Catskill turnpike (section 3) road, No. 483, Tompkins county	Middle	44,400 00	35,655 25	23,202 82
Stewart-Kerbaugh-Shanley Co.	Oct. 18, 190	Belle Isle road, No. 488, Onondaga county	Middle	17,800 00	17,633 90	13,847 84
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Massena-Waddington (sections 1, 2, 3 and 4) road, No. 521, St. Lawrence county	Middle Middle	61,800 00	59,660 00	49,719 00
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Cortland-Dryden (section 2) road, No. 535, Cortland county	Middle	21,750 00	20,019 60	11,702 97

* Contract price for all roads on Middle Division does not include special agreements.

TABLE OF CONTRACTS PENDING FEBRUARY 17, 1909 —(Concluded).

Improvement of Public Highways — (*Concluded*).

Chapter 115, Laws of 1898; chapter 468, Laws of 1906, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	*Contract price, plus special agreements.	Payments to February 17, 1909.
Brown & Lowe	Jan. 29, 1908	Rome–Northwestern (section 2) road, No. 562, Oneida county	Middle	$41,400 00	$37,685 38	$2,875 84
Hyde, Hyde & Edy	Mar. 4, 1908	Rome–Taberg road, No. 563, Oneida county	Middle	60,350 00	49,660 42	29,592 09
Chambers & Grady	Dec. 4, 1907	Homer–Tully (section 2) road, No. 595, Cortland county	Middle	45,650 00	43,327 45	18,758 97
Delaware Construction Co	Feb. 4, 1908	Smyrna–Otselic road, No. 599, Chenango county	Middle	62,400 00	60,169 90	32,419 24
Stewart-Kerbaugh-Shanley Co	Sept. 20, 1907	Auburn-Owasco road, No. 614, Cayuga county	Middle	59,000 00	54,662 15	34,631 64
Stewart-Kerbaugh-Shanley Co.	Dec. 18, 1907	Cato–Meridian–Baldwinsville road, No. 684, Cayuga county	Middle	59,400 00	55,752 65	46,921 83
Ryan & Yale	April 23, 1908	Ogdensburg-Canton (section 1) road, No. 732, St. Lawrence county	Middle	75,550 00	64,472 50	42,195 11
Ryan & Yale	April 23, 1908	Ogdensburg-Canton (section 2) road, No. 733, St. Lawrence county	Middle	80,100 00	67,115 65	45,181 77

* Contract price for all roads on Middle Division does not include special agreements.

TABLE OF CONTRACTS PENDING SEPTEMBER 30, 1909.

Construction of Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of Contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Payments to September 30, 1909.
Empire Engineering Corporation	April 18, 1905	Contract No. 1, Champlain canal — Hudson river, Northumberland to Fort Miller and Crocker's Reef to Fort Edward	Eastern	$619,846 00	$580,423 57	$425,847 74
Ferguson Contracting Co.	April 3, 1905	Contract No. 2, Erie canal — Through Waterford to Contract No. 11	Eastern	1,022,640 00	946,105 76	660,893 32
Sundstrom & Stratton	April 4, 1905	Contract No. 3, Champlain canal — Fort Miller to Crocker's Reef	Eastern	760,576 00	657,273 09	619,401 82
Groton Bridge Co.	Aug. 10, 1906	Contract No. 7, Erie and Champlain — Bridges on Contracts Nos. 2, 3, 4, 5 and 6	Eastern. Middle Western	102,122 70	101,929 95	99,080 00
Pittsburg-Eastern Co.	May 22, 1906	Contract No. 8, Erie canal — Dams and locks at Scotia, Rotterdam and Cranesville	Eastern	1,518,382 00	1,515,626 42	587,304 00
Fort Orange Construction Co.	May 21, 1906	Contract No. 11, Erie canal — From Contract No. 2 to Mohawk river	Eastern	1,671,385 00	1,354,864 00	649,692 00
Penn Bridge Co.	Nov. 7, 1908	Contract No. 13, Erie canal — Bridges on Contracts Nos. 18 and 12	Eastern. Middle	29,775 00	23,674 00	....
Acme Engineering & Contracting Co.	Sept. 10, 1907	Contract No. 14, Erie canal — Mohawk river, Crescent to Rexford Flats aqueduct; dams at Crescent and Mindenville; dams and locks at Vischer's Ferry, Canajoharie, Yosts and Fort Plain	Eastern	2,875,570 00	2,964,988 80	1,231,348 00
Atlantic, Gulf & Pacific Co.	Aug. 9, 1906	Contract No. 15, Champlain canal — Whitehall to Comstock	Eastern	1,380,760 00	1,463,161 15	841,528 00
United Construction Co.	Dec. 20, 1906	Contract No. 16, Erie and Champlain canals — Bridges on Contracts Nos. 11, 25 and 27	Eastern	70,719 00	69,076 95	4,842 00
The Scofield Co.	Dec. 29, 1906	Contract No. 17, Erie canal — Dams and locks at Amsterdam and Tribes Hill	Eastern	883,926 00	842,613 28	48,744 00
†Alexander Murdock	Mar. 3, 1908			836,221 00	812,286 70	356,942 42
O'Brien & Hoolihan Contracting Co.	Dec. 28, 1906	Contract No. 18, Erie canal — Mindenville to Castle creek	Eastern	785,980 00	854,594 00	355,453 00
Houston Barnard	Aug. 20, 1909	Contract No. 20-A, Erie canal — Little Falls to Castle creek	Eastern	499,000 00	490,592 00	....
S. Pearson & Son, Inc.	Aug. 2, 1909	Contract No. 20-B, Erie canal — Mohawk river, Mindenville to Canajoharie	Eastern	848,540 00	933,194 00	72 00
American Pipe & Construction Co.	Aug. 19, 1909	Contract No. 20-C, Erie canal — Mohawk river, Canajoharie to Yosts	Eastern	570,600 00	585,720 00	....

† Contract relet.

TABLE OF CONTRACTS PENDING SEPTEMBER 30, 1909 —(Concluded).

Construction of Barge Canal —(*Concluded*).

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Division.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Payments to September 30, 1909.
American Pipe & Construction Co.	Aug. 18, 1909	Contract No. 20-D, Erie canal — Mohawk river, Yosts to Rexford Flats	Eastern	$2,260,000 00	$2,681,040 40	....
Atlantic, Gulf & Pacific Co.	Nov. 19, 1906	Contract No. 25, Champlain canal — Comstock to Dunham's Basin	Eastern	1,849,831 00	1,698,388 60	$801,766 00
Lake Erie Dredging Co.	April 6, 1908	Contract No. 26, Champlain canal — Hudson river near Fort Edward	Eastern	60,225 00	40,057 00	19,332 00
Kinser Construction Co.	Nov. 23, 1906	Contract No. 27, Champlain canal — Dunhams Basin to Fort Edward	Eastern	998,920 00	723,268 61	355,670 02
Maryland Dredging & Contracting Co.	April 3, 1909	Contract No. 29, Erie canal — Sterling creek to Herkimer-Oneida county line	Eastern	812,350 00	683,713 66	27,369 00
Acme Engineering & Contracting Co.	July 16, 1909	Contract No. 30, Erie canal — Mohawk river, Little Falls to Sterling creek	Eastern	2,650,500 00	2,591,666 50	....
Casey & Murray	Sept. 2, 1908	Contract No. 31, Erie canal — Through Little Falls; Rocky Rift dam	Eastern	813,800 00	829,305 78	256,096 27
Penn Bridge Co	April 19, 1909	Contract No. 32, Champlain canal — Lock-gates, etc., on Contracts Nos. 3, 25 and 27	Eastern	59,820 00	46,797 00	....
Shanley-Morrissey, Inc.	Nov. 23, 1908	Contract No. 68, Champlain canal — Locks at Mechanicville, Stillwater and Northumberland	Eastern	1,175,623 00	1,018,323 00	294,696 00
Empire Engineering Corporation	April 18, 1905	Contract No. 4, Erie canal — The 4½ miles east of Oneida lake	Middle	812,560 00	729,567 70	579,858 29
Empire Engineering Corporation	April 18, 1905	Contract No. 5, Erie canal — Mosquito Point to Fox Ridge	Middle	421,252 50	375,871 57	113,238 00
McDermott Contracting Co	June 7, 1906	Contract No. 10, Oswego canal — Through Fulton	Middle	1,149,988 00	1,111,964 57	322,804 00
Stewart-Kerbaugh Shanley Co.	Sept. 23, 1907	Contract No. 12, Erie canal — Oneida lake to Mosquito Point	Middle	3,082,560 00	3,514,819 16	778,351 51
Gilmoure-Horton-Allen Co.	Sept. 16, 1907	Contract No. 35, Oswego canal — Through Oswego	Middle	752,760 00	699,069 45	189,229 95
Shanley-Morrissey, Inc.	July 9, 1909	Contract No. 42, Erie canal — Utica to Oriskany	Middle	1,312,814 00	1,163,625 00	16,011 00
Scott Bros.	May 6, 1908	Contract No. 45, Erie canal — Through Baldwinsville; Caughdenoy dam	Middle	425,124 00	469,881 05	307,683 00
Kinser Construction Company.	Nov. 23, 1908	Contract No. 46, Erie canal — Fox Ridge to Galen town line	Middle	1,367,583 00	1,212,833 00	140,328 00
Scott Bros.	Aug. 16, 1909	Contract No. 53, Oswego canal — Through Phoenix	Middle	200,500 00	166,735 00	1,413 00

Arthur McMullen	Oct. 19, 1908	Contract No. 55, Erie canal — Delta reservoir	Middle	1,014,525 00	905,347 00	181,449 00
F. A. Maselli	May 3, 1905	Contract No. 6, Erie canal — Buffalo road, southeast of Rochester, to near South Greece	Western	1,381,662 50	1,026,549 80	766,057 54
Thos. Crimmins Contracting Co.	Mar. 18, 1908	Contract No. 9, Erie canal — Eagle Harbor to Beal's bridge	Western	724,014 00	760,752 38	296,082 00
Great Lakes Construction Co.	Nov. 26, 1906	Contract No. 19, Erie canal — Sulphur Springs guard lock to Ellicott creek	Western	1,038,245 00	891,401 16	284,208 05
Millard & Lupton Co.	Aug. 18, 1909	Contract No. 23, Erie canal — Kings Bend to Genesee river	Western	2,166,600 00	1,887,036 00	....
Henry Tosh & Son	Jan. 11, 1909	Contract No. 38, Erie canal — Wapping's bridge	Western	20,131 25	16,869 90	14,199 28
United Eng. and Cont. Co	Nov. 27, 1908	Contract No. 40, Erie canal — Locks at Lockport to Sulphur Springs guard-lock	Western	2,516,743 00	2,166,298 00	122,274 00
Butler Bros. and Hoff Co	Dec. 5, 1908	Contract No. 41, Erie canal — Irondequoit creek crossing	Western	383,190 00	281,330 00	81,369 00
Crowell-Sherman-Stalter Co	Nov. 30, 1908	Contract No. 47, Erie canal — Town of Galen to Lyons	Western	1,434,148 00	1,273,071 35	106,650 00
Empire Engineering Corporation	Aug. 7, 1908	Contract No. 60, Erie canal — Near South Greece to near Adams Basin bridge	Western	1,267,301 00	1,402,076 28	475,576 87
Cleveland Sons Co	Oct. 13, 1908	Contract No. 61, Erie canal — Near Adams Basin to Monroe Orleans county line	Western	1,000,219 00	1,047,994 00	73,152 00
Empire Engineering Corporation	Aug. 6, 1908	Contract No. 64, Erie canal — Near Prospect street bridge, Medina, to near Gasport bridge	Western	1,207,930 00	1,288,830 12	199,755 00
Empire Engineering Corporation	Sept. 22, 1908	Contract No. 66, Erie canal — Near Gasport bridge to near locks at Lockport	Western	751,039 00	750,685 50	157,828 50

REPORT

OF THE

DIVISION ENGINEER

OF THE

EASTERN DIVISION

For the Fiscal Year Ended September 30, 1909

EASTERN DIVISION

State of New York,
Department of State Engineer and Surveyor,
Eastern Division.

Albany, *October* 1, 1909.

Hon. Frank M. Williams, *State Engineer and Surveyor:*

Sir.— I have the honor to submit herewith my annual report as Division Engineer of the Eastern Division of your Department for the fiscal year ended September 30, 1909.

The chief work of this Division has consisted in performing the necessary engineering work in connection with the present canal system and making surveys, plans and supervising construction of the new Barge canal; also for four and a half months of the fiscal year the making surveys, plans and the supervising improvement of highways under chapter 115, Laws of 1898, was in charge of this Department.

For canal purposes the Eastern Division comprises that part of the canal system of the State extending from the Hudson river at Albany to the east line of Oneida county, and from the junction of the Erie and Champlain canals to the south end of Lake Champlain.

For highway improvement purposes there were included in the Eastern Division the counties of Albany, Clinton, Columbia, Delaware, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Herkimer, Montgomery, Nassau, Orange, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington and Westchester, with a total highway mileage of 31,538 miles.

Coöperation has been extended and assistance given to the Department of Public Works in making surveys, plans and estimates whenever it has been requested. Surveys have been made and testimony given on behalf of the State in the Court of Claims in suits brought against the State for damage resulting from leaks and breaks in the canal.

BARGE CANAL.

(Chapter 147, Laws of 1903.)

For the purpose of Barge canal work the Eastern Division has been divided into the following residencies:

Erie canal, Residency No. 1. From the Congress street bridge crossing the Hudson river at Troy to the west end of the lower Mohawk aqueduct at Crescent, including that portion of the Hudson river which is common to the main line of the canal and of the Champlain canal.

Erie canal, Residency No. 2. From the west end of the lower Mohawk aqueduct at Crescent, to the head of old lock No. 27, situated about three-fourths of a mile west of Cranesville, Montgomery county.

Erie canal, Residency No. 3. From the head of old lock No. 27 to the head of old lock No. 34 at Mindenville, Montgomery county.

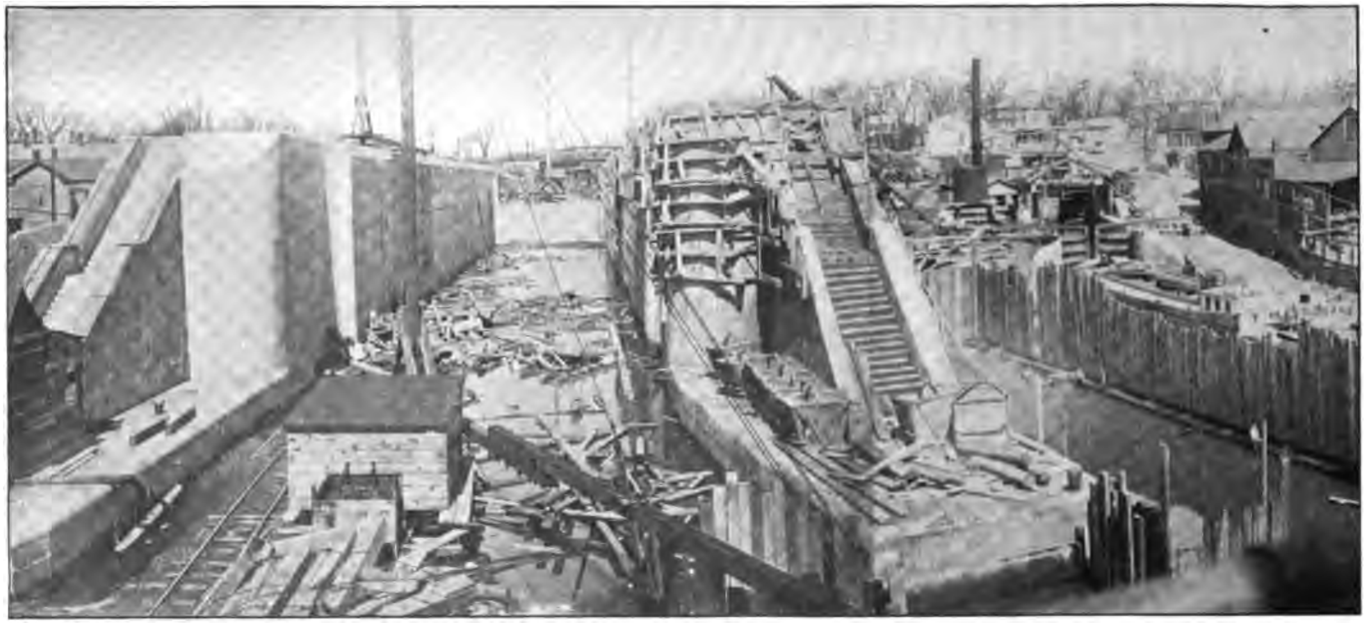
Erie canal, Residency No. 4. From the head of lock No. 34 to the easterly line of Oneida county, which is also the east line of the city of Utica.

Champlain canal, Residency No. 1. From the junction of the Barge canal and Champlain canal, in the Hudson river east of Waterford, to the foot of old lock No. 10, near Northumberland dam, Washington county.

Champlain canal, Residency No. 2. From the foot of lock No. 10, near Northumberland dam, Washington county, to the highway crossing the present Champlain canal at Dunhams Basin, Washington county, including the Glens Falls feeder, dam and pond above.

Champlain canal, Residency No. 3. From the highway crossing the present Champlain canal at Dunhams Basin, Washington county, to Lake Champlain.

In supervising the work of construction it has not been practicable in all cases to limit the territory of a Resident Engineer strictly to the confines of the residencies, as here described, since some of the contracts include work in more than one residency. The reports of the several Resident Engineers, covering descriptions of the work under their charge and accounts of what has been done during the fiscal year, will be found in the following pages. These reports are chiefly concerned with construction work, the making



BARGE CANAL, CONTRACT NO. 2.
View of lock No. 2 at Waterford. Three of the present Champlain canal locks are shown at the right.

of plans and estimates for the whole canal being done largely under the Special Deputy State Engineer at the head office, which, though located within this division, has to do with canal work throughout the state.

ERIE CANAL, RESIDENCY NO. 1.

Assistant Engineer H. O. Schermerhorn reports:

"This residency embraces that section of the Erie canal extending from the Congress Street bridge at Troy to the lower Mohawk aqueduct at Crescent. The work located on this section on which construction operations have continued during the whole or part of this year is known as contracts No. 2 and No. 11. The office work of the residency has consisted of making and checking estimates on construction work, preparation of reports, regular office correspondence, etc.

"*Contract No.* 2. Construction work continued on this contract during only the months of October and November. The plant was closed down on November 30 and work was not again resumed, owing to the contractor failing to agree to a change in plans. When ordered to continue operations, the contractor refused and subsequently further work was suspended on the contract by an order of the Canal Board, passed May 13, 1909, in accordance with the provisions of the Barge Canal Law. Surveys were then made and the amount of work remaining to be done to complete the contract determined. This uncompleted portion of the work was accordingly put under a new contract, known as contract No. 2-E, bids for which are to be opened on October 5.

"During the fiscal year the following excavation was done: That necessary for the completion of the north wall of lock No. 2 and a small amount at the lower approach walls of lock No. 3. No embankment was placed.

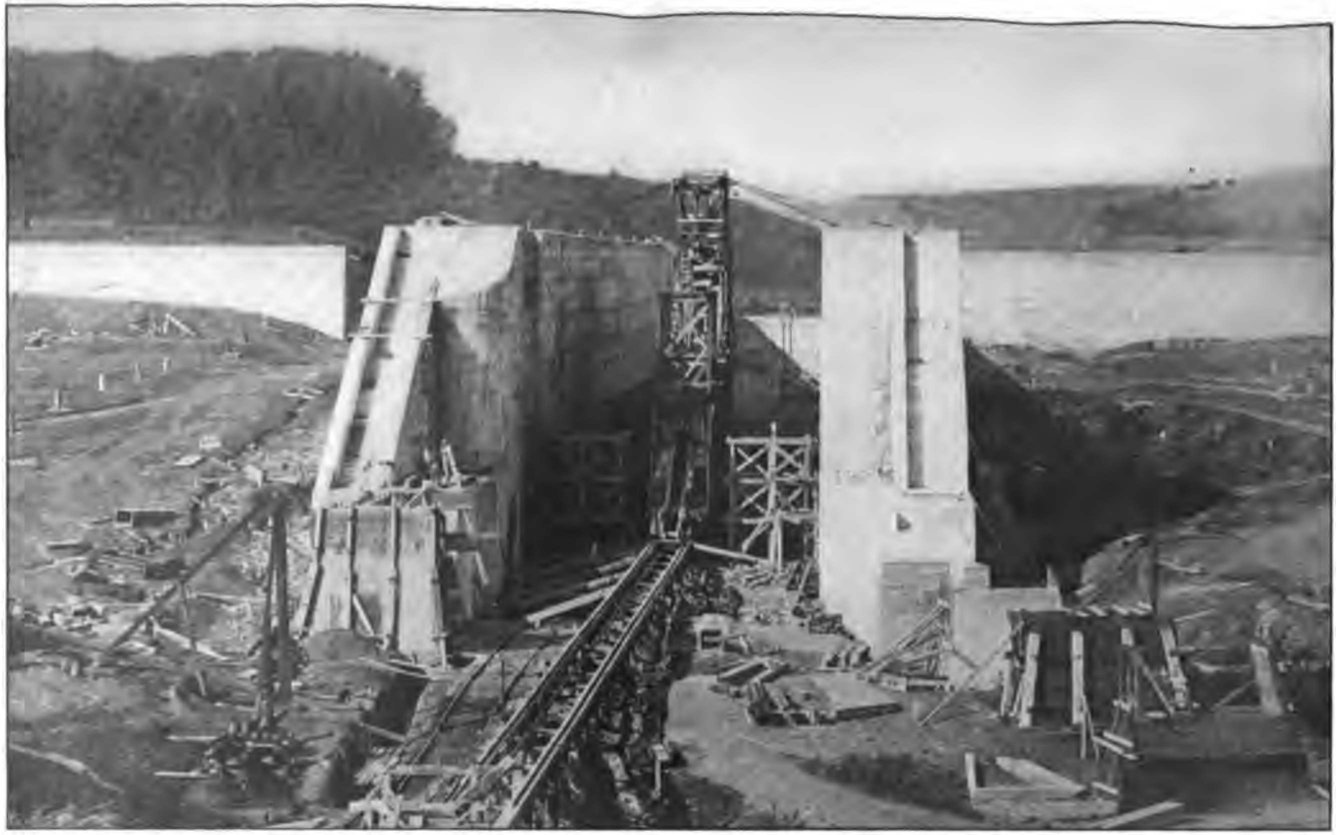
"Concreting was continued up to the time the plant was closed down, the Hains mixer being used. Concrete in lock No. 2 was completed, except for the floor, and the foundation for about 30 feet of the north lower approach wall to lock No. 3 was placed. The uncompleted portions of the Saratoga avenue bridge abutments were also completed. The approaches to Saratoga Ave. bridge were completed under an extra work order, dated September 30, 1908.

"The only items of work completed up to and including alteration No. 6 are shown in the following table. The amount and percentage of work done during the fiscal year, together with the total amount and percentage of work done to date, is also given below.

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing	Lump sum	5%	95%	5	95
Grubbing.....cu. yds.	1,200	....	135	Finished	Finished
All excavation.....cu. yds.	584,809	555	425,991	....	73
Sheeting and bracing.....ft. B. M.	50,000	....	23,600	....	47
Forming embankment.....cu. yds.	110,410	....	58,420	....	53
Foundation piles, 15 ft. and 20 ft. long.....No.	2,130	....	1,485	....	70
Foundation piles, 25 ft. long.....No.	100	....	3	....	3
Second-class concrete.....cu. yds.	95,664	11,759	82,498	12	86
Third-class concrete.....cu. yds.	500	....	414	....	83
Portland cement sidewalk.....sq. ft.	3,500	508	508	Finished	Finished
First-class masonry coping.....cu. yds.	7	....	6.9	Finished	Finished
Cast iron pipe and specials.....lbs.	15,000	....	14,273	Finished	Finished
Iron castings.....lbs.	232,900	15,749	209,362	7	90
Steel castings.....lbs.	15,000	2,056	12,659	Finished	Finished
Structural steel.....lbs.	106,348	6,702	55,157	6	52
White oak miter-sills.....ft. B. M.	6,000	....	2,840	....	47
Thirty-inch sluice-gate, including operating stand	Lump sum	....	100%	....	Finished
Iron castings, machined.....lbs.	58,000	7,915	63,570	....	Finished
Additional bailing and draining, Lock No. 2	Lump sum	25%	88%	25	88
Additional bailing and draining, Lock No. 3	Lump sum	5%	95%	5	95
Additional lumber and labor, concrete forms	Lump sum	15%	93%	15	93
Additional materials, finishing concrete	Lump sum	11%	81%	11	81
Fender fastenings.....each	860	....	367	....	43
Removing concrete.....cu. ft.	600	....	332	....	55
Dressing surface.....sq. ft.	380	....	206	....	54
Cast iron quoin-plates.....lbs.	30,000	8,262	20,872	27	69

"*Contract No.* 11. Construction work continued on this contract up to December 9, at which time the entire plant was shut down and operations were not resumed until about the middle of April, 1909. Excavation, embankment and concrete are the principal items on which work has been done during the year.

"EXCAVATION. The amount of material excavated during the year has been relatively small on account of the difficulty of placing it in the necessary embankment about the several structures. The prism below lock No. 4 is now complete, except for a small amount of trimming up and cleaning on the bottom. Lock No. 4 is completed, except for about 600 cu. yds. in the unfinished portions of the lock floor. About 50 per cent of the excavation for the concrete docking piers between locks Nos. 4 and 5 has also been completed. From the beginning of the fiscal year until the plant shut down in December the steam-shovel Vulcan continued work in the big cut above lock No. 6, removing about 8,300 cu. yds. There still remain to be excavated about 90,000 cu. yds. in this cut.



BARGE CANAL, CONTRACT NO. 11.
View of lock No. 5,— fourth (going west) of a flight of five locks on the land line between the Hudson and Mohawk rivers. Core-walls, marking confines of pool, are seen at upper end of lock.

When operations started in the spring, this shovel was removed to the site of lock No. 6. Up to the end of the year about 30,000 cu. yds. were excavated, representing about 61 per cent of the total amount for this structure.

" EMBANKMENT. The material excavated from the site of lock No. 4 and in the prism below the lock was placed in first and second-class embankment behind the north wall of lock No. 4 and along the core-walls at the head of the lock. The material taken from the excavation for lock No. 6 was placed in embankment around the walls of lock No. 5 and along the core-walls at the head of lock No. 5 and a small amount on the north side of lock No. 6.

' CONCRETE. The work of building the lower approach walls to lock No. 4 is progressing slowly. The south approach wall is complete, except for two short sections where the by-pass enters the canal. The north approach wall is less than one-half completed. Practically all the concrete in lock No. 4 was placed during the year. The lock is now complete, except for about 1,000 cu. yds. in the floor. The north and south core-walls above lock No. 4 were completed with the exception of two sections left open for construction purposes. The line of concrete docking piers, 32 in number, on the north side of the prism between locks Nos. 4 and 5, were completed.

" ROCK CHANNELING. Progress in channeling the rock in the big cut above lock No. 6 has been remarkably slow. During the year only 8,900 sq. ft. have been completed, representing less than 10 per cent of the total amount in the contract. The amount done to date is but 46 per cent of the whole. The channeler worked two shifts daily from April until August and from August on, one shift. Considerable time has been spent making repairs to the machine.

" The only items of work completed are foundation piles, dressing concrete and removing concrete.

"The following table gives a summary of work done during the fiscal year and the total complete to date:

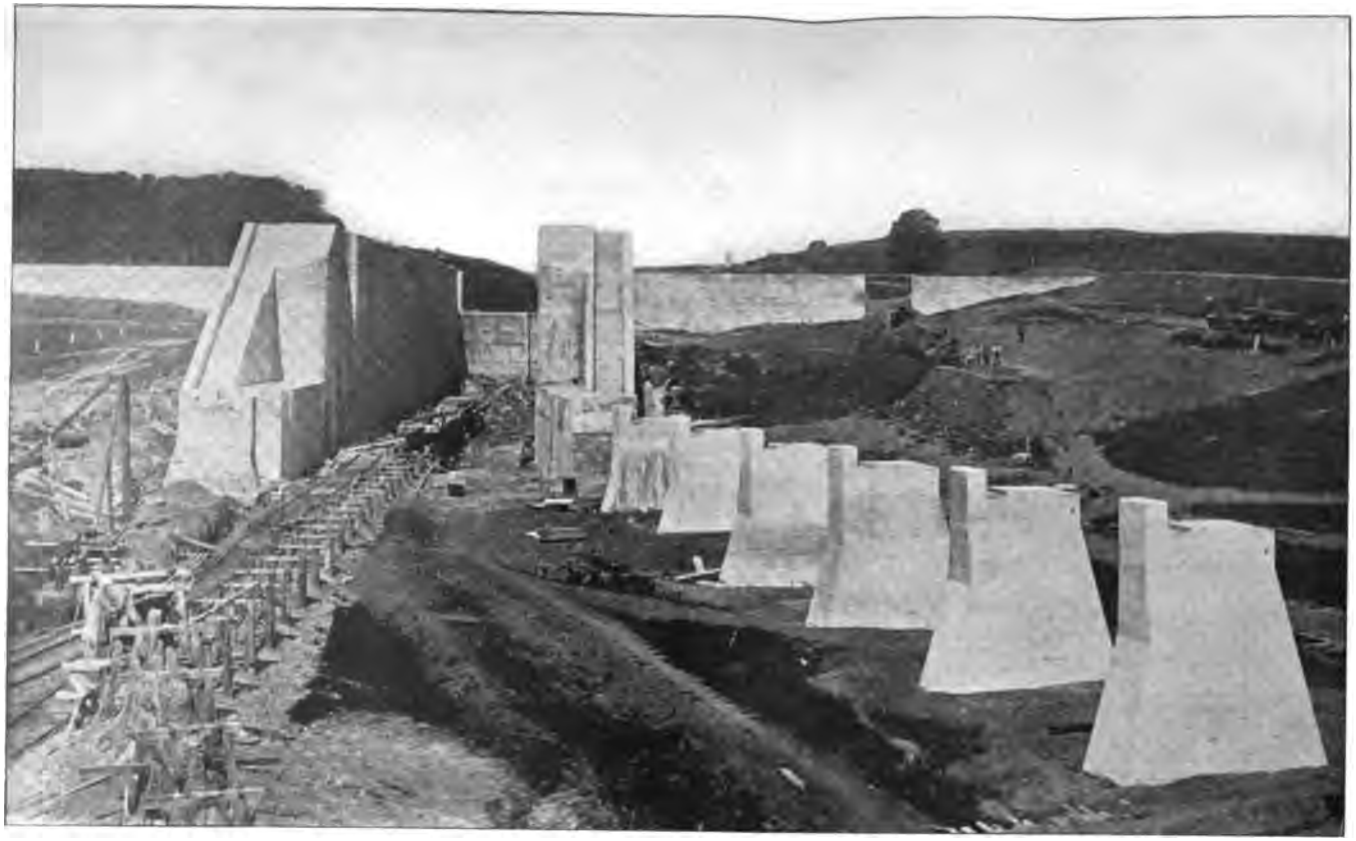
ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing...........................	Lump sum	....	90%	....	90
Grubbing........................cu. yds.	15,000	....	8,094	....	54
Excavation........................cu. yds.	799,100	118,746	514,326	14.8	64.4
Sheeting and bracing...............ft. B. M.	200,000	21,990	223,958	10.9	111.9
Rock channeling......................sq. ft.	96,000	8,874	44,386	9.2	46.2
Embankment, first-class.............cu. yds.	116,300	26,628	62,123	22.9	53.4
Embankment, second-class..........cu. yds.	275,000	55,346	118,932	20.1	43.2
Lining............................cu. yds.	6,290	....	2,245	....	35.7
White oak lumber.................ft. B. M.	9,600	1,421	4,241	14.8	44.1
Foundation piles, 15 ft. long............No.	89	....	75	....	Finished
Foundation piles, 20 ft. long............No.	261	....	258	....	Finished
Concrete..........................cu. yds.	160,850	38,815	82,459	24.1	51.2
Steel castings..........................lbs.	20,000	6,312	12,622	31.5	63.1
Iron castings, plain....................lbs.	378,100	96,901	194,963	25.6	51.5
Iron castings, machined.................lbs.	90,100	28,030	56,014	30.0	60.1
Structural steel.........................lbs.	115,200	7,413	17,245	6.4	14.9
Metal reinforcement....................lbs.	428,600	453	1,659	.01	.4
Cast iron quoin-plates..................lbs.	46,000	15,708	31,587	34.1	68.6
Removing concrete...................cu. ft.	216	....	188	....	Finished
Dressing concrete....................sq. ft.	100	....	91	....	Finished

"The work of making and mapping surveys for lands to be appropriated on Residency No. 2, on account of the construction of dams Nos. 2 and 3, at Crescent and Vischer's Ferry, respectively, has been handled from this office. A report of this work follows.

"The work of these surveys consists of staking out and locating the low-water flow line, the maximum navigable flood line and the maximum flood line, locating the intersecting property lines, buildings and other topography, together with the preparations of the regular maps and descriptions of all lands to be appropriated. During the year the following territory has been covered:

"On the north shore from three-fourths mile east of aqueduct No. 2 to aqueduct No. 2.

"On the south shore surveys were completed from aqueduct No. 2 to the State dam, also surveys were completed for the land appropriations made necessary by the relocation of the Troy-Schenectady branch of the N. Y. C. & H. R. R. from a point 1.4 miles west of lock No. 7 easterly to Niskayuna Station. Additional surveys were made in the vicinity of Crescent, south shore, to relocate the flow lines, as they had not previously been located by a chain survey. Additional surveys were also made in this locality, owing to a decision of the Department to appropriate to the maximum navigable flood line instead of to the maximum flood line. Additional



BARGE CANAL, CONTRACT No. 11.
View showing docking piers being built between locks Nos. 4 and 5, near Waterford.

surveys have also been made on the north shore in the vicinity of Dunsbach Ferry to check up old circuits found in error. The following summary shows the surveys made during the year to complete the above: New circuits, 11.45 miles; property lines, 3.31 miles; red and blue line along present Erie canal, 2.41 miles; picking up old circuits and base line, 3 miles; checking over old circuits, 6.35 miles; the 217-foot flow line staked out and located, 0.7 mile; the 194-foot flow line staked out and located, 1.5 miles; the 191-foot flow line staked out and located, 2.25 miles; the 188½-foot flow line staked out and located, 1.09 miles.

"The territory from the west end of contract No. 11 to Fords Ferry has been mapped in pencil on mounted sheets, but not checked. This work was discontinued May 18, and the available force transferred to surveys of contract No. 2-E, and only four days has been spent on same since that date.

"Appropriation maps have been completed and sent to Albany for the property owned by J. H. Cross at Rexford Flats and the Aqueduct. Appropriation maps have been completed and sent to Albany, together with forms 49 and 50, for the land necessary for the relocation of the railroad from a point 1.4 miles west of lock No. 7 to a point 0.5 mile east of Vischer's Ferry road, a total of 11 parcels. Maps were traced and descriptions written for land to be abandoned to the railroad company from a point 1.25 miles west of lock No. 7 easterly to the rock cut near lock No. 7. On the north shore in the vicinity of Crescent appropriation maps have been partially completed, from the west end of contract No. 11 to a point 1.3 miles west of the village of Crescent, a total of 29 parcels. On the south shore in the vicinity of Crescent all appropriation maps from the abutting property at the south end of dam No. 2 to a point one mile west of Crescent have been completed and sent to Albany, together with forms 49 and 50, a total of 8 parcels. Additional computations have been completed for continuing the appropriation maps."

ERIE CANAL, RESIDENCY NO. 2.

Resident Engineer E. J. Pickwick reports:

"This residency extends from the lower Mohawk aqueduct at Crescent to the head of old lock No. 27 at Cranesville, a distance of 27 miles.

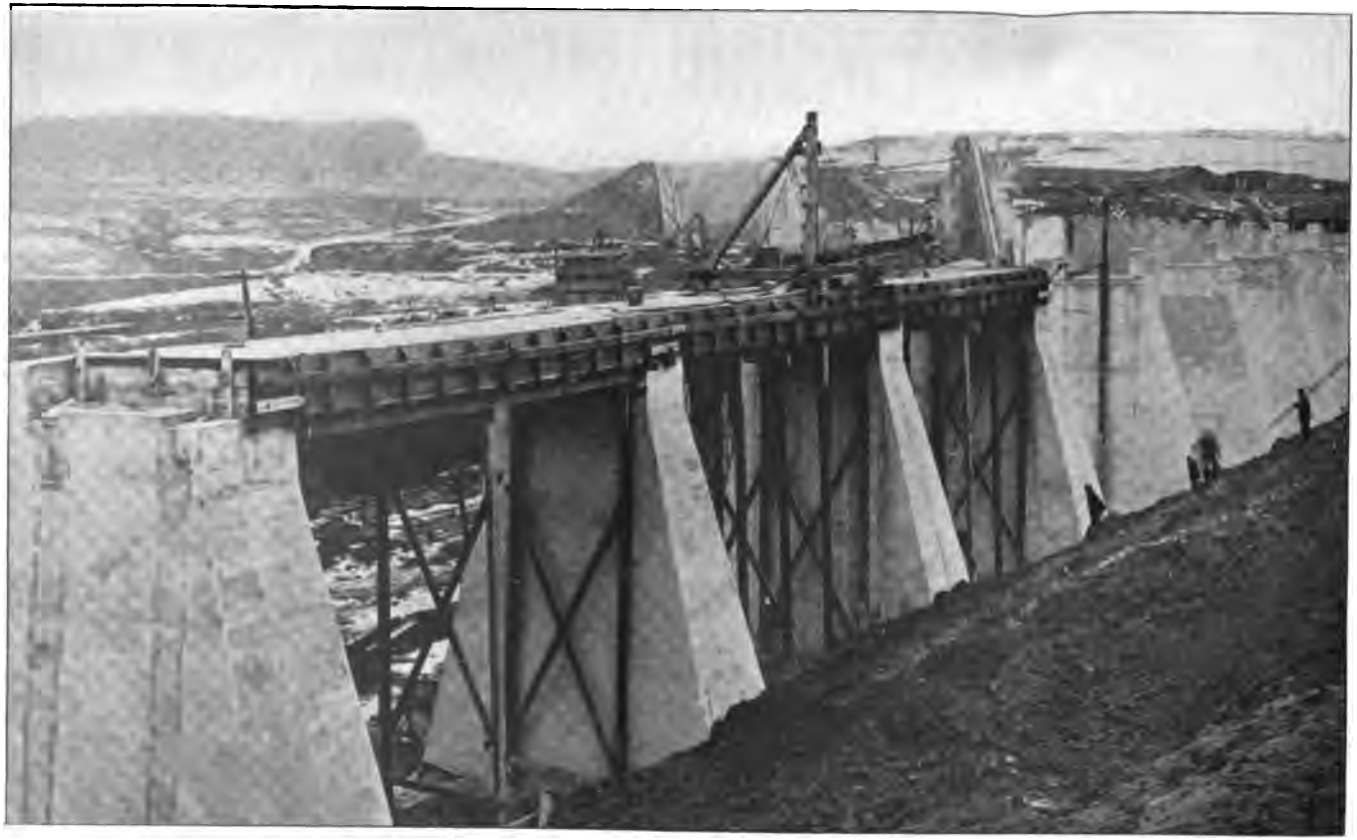
"The work of appropriating lands for contract No. 14 has continued under the direction of C. A. Poole, Resident Engineer for Residency No. 1. A part of the dredging in this residency is included under contract 20–D and is under the direction of Resident Engineer E. A. Lamb.

"The past year has been occupied largely in a vigorous prosecution of the work on the following structures: Dam 2 and highways and dam 3, lock No. 7, all under sections 1 and 2 of contract No. 14. Also movable dams Nos. 4, 5 and 6 and locks Nos. 8, 9 and 10, under contract No. 8, together with data and reports for appropriated lands and claims, gage readings of the lower Mohawk river, and inspection and reshipment of 36,000 barrels of cement used on State work outside of this residency.

"*Contract No.* 14, *Sections* 1 *and* 2. At dam No. 2, Crescent, concreting in the west half of dam "A" continued till December 24, 1908. In May, 1909, a coffer was built to enclose the east half of dam "A" and the river diverted through the openings left in the concrete of the west half. Abutments "B" and "C" and headgates are completed; dams "A" and "B" about 80 per cent built, and dam "C" 30 per cent built. Thirty-six thousand cubic yards of earth and rock have been excavated and 31.000 cu. yds. of concrete and 25 tons of metal placed in these structures. The plant used consists of a 250-horse-power compressor, electrically driven, McMyler traveler, derrick boat, traveling derrick, four guy derricks, Thew steam shovel, drills, pumps 2-yd. Hains concrete mixer and trains. The quarry and crusher at this site has been operated throughout the year for crushed and embedded stone.

"At the Crescent highways the grading and surfacing are nearly completed; about 15,000 cu. yds. were excavated and 14,500 cu. yds. of embankment made, most of this work being done by a 35-ton revolving Thew steam-shovel, Watson wagons and rollers.

"At dam No. 3, lock No. 7, Vischer's Ferry, the alternate sections of dam "D" were completed and the river wall of lock 7 built to elevation 204.0 by December 24, 1908. The upper and lower approach walls and the river walls of the lock are completed; the land wall of lock is about 75 per cent done and prism exca-



BARGE CANAL, CONTRACT No. 11.
View showing concrete slabs being built on piers between locks Nos. 4 and 5. The docking, or guide wall, will separate the channel from the remainder of the pool between these locks.

vation at lower approaches 25 per cent made. About 15,000 cu. yds. of excavation and 4,000 cu. yds. of embankment have been made and 40,000 cu. yds. of concrete and 67 tons of metal placed in dam "D" and in lock 7 and approaches, besides 800 piles for lower approach walls and 216,700 feet of timber in cribs for upper approaches. The plant used consists of two 250-horse-power compressors, steam driven, two Lidgerwood cables, 1,000 feet long, 4 traveling derricks, 2 clam-shell derricks, 2-yd. Hains concrete mixer and trains, drills, pumps, etc., and repair shops.

"On contract No. 14, sections 1 and 2, the average daily force has been 350 men and 10 teams, working eight-hour shift; the maximum daily force on October 23, 1908, was 470 men and 17 teams, working eight-hour shift.

"The following table gives the summary of work done during the year and the total completed to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date
Clearing	1	....	30%	....	30
Grubbing cu. yds.	2,975	....	46.3	....	1.6
All excavation cu. yds.	811,572	64,789	186,719	8	23
Sheeting and bracing M. ft. B. M.	150	0.5	0.5	0.4	0.4
First-class embankment cu. yds.	173,890	19,658	29,458	1.1	1.7
Second-class embankment cu. yds.	30,560	512	10,646	0.1	3.3
Lining cu. yds.	1,300	777	777	59.7	59.7
Sawed lumber (hemlock) M. ft. B. M.	1,596	216.7	216.7	13.6	13.6
Stone filling in cribs cu. yds.	10,485	2,827	2,827	27	27
Foundation piles, 16 ft. long No.	3,401	787	787	23.1	23.1
Foundation piles, 20 ft. long No.	84	4	4	4.8	4.8
Mooring piles, 20 ft. long No.	40	14	14	35	35
First-class concrete cu. yds.	21,000	10,483	12,769	49.8	60.7
Second-class concrete cu. yds.	211,463	60,614	81,207	28.6	38.4
Reinforced concrete cu. yds.	55	12.8	49.8	23.6	90.8
24-inch vitrified pipe lin. ft.	200	0	181	0	90.7
Structural steel lbs.	2,583,627	29,778	29,778	1.1	1.1
Metal in lock-gates lbs.	845,000	330	330	0.1	0.1
Metal in needle-dams lbs.	330,000	1,583	1,583	0.5	0.5
Metal in head-gates lbs.	280,000	39,570	39,570	14.2	14.2
Metal in reinforcement lbs.	205,589	3,034	6,279	1.5	3
Steel castings lbs.	7,000	3,840	3,840	55	55
Iron castings, plain lbs.	163,000	61,786	89,986	37.7	55
Iron castings, machined lbs.	55,000	29,554	36,414	54.2	66.1
Fender fastenings No.	1,170	1,014	1,014	88	88
Sluice-gate, 36 x 24 ft.	2	0.5	0.5	25	25

NOTE.—This table covers work on that part of contract No. 14 which is situated within the limits of Residency No. 2, namely, sections 1 and 2.

"*Contract No.* 8. At dam No. 4, lock No. 8, Scotia, the Fidelity Construction Co. began excavating the site of the lock in October, 1908, and built a coffer about the north span of the dam during the following month. After removing 15,000 cu. yds. by steam-shovel and trains from the lock site and 6,000 cu. yds. by orange-peel derrick and small cars from the dam, operations were suspended about January 1, 1909, and have not been renewed. The Pittsburg Eastern Co. is building a derrick boat and making preparations to begin work on the upper guide-wall of lock.

"At dam No. 5, lock No. 9, Rotterdam, the work of excavation and concreting in the lock was continued till December 24, 1908, and resumed again early in March, 1909. Good progress has been made here this year in spite of the difficulties arising from the quaky material under the foundation. The following items show this year's volumes: Excavation, 30,000 cu. yds.; embankment, 12,000 cu. yds.; 1–2½–5 gravel concrete, 19,000 cu. yds.; riprap, 1,100 cu. yds.; foundation piles, 7,800, and metal, 90 tons. The lock and guide-walls, together with the north span of the movable dam, are practically completed and some work has been done at the south abutment. The plant used consists of a No. 60 Marion steam-shovel, excavating from local pit the gravel washed for concrete, stone crusher and washing and screening plant, two traveling derricks, three stiff-leg derricks, one guy derrick, Lidgerwood cableway, 850 feet long, steam pile-driver, 1½-yd. Hains concrete mixer, two 16-ton Vulcan engines, cars, tracks, pumps, etc.

"At dam No. 6, lock No. 10, Cranesville, work on the lower end of lock and at the movable dam has been in progress for the year, except for the winter period, and when moving to new coffers. The lock and guide-walls and the south and middle spans of the dam, including both river piers, are about completed. The north abutment and shore protection were built under a subcontract and finished early in 1909. The amount of work done is shown in the following items: Excavation, 22,200 cu. yds.; embankment, 11,200 cu. yds.; 1–2½–5 concrete, 9,500 cu. yds.; foundation piles, 1,300; riprap, 3,600 cu. yds., and metal, 113 tons. The plant used was, 3 stiff-leg derricks, 1 guy derrick, derrick boat, washing and screening plant, 1½-yd. Hains mixer and trains,

drills, pumps, etc.; also small crusher and mixer at north shore.

"On contract No. 8, the average force for the construction season was 249 men and 12 teams, working eight-hour shift; the maximum force, during the week ended October 23, 1908, was 352 men and 18 teams, working eight-hour shift.

"The following table gives the summary of work done during the year and the total completed to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	1	0.33	1	.33	100
Excavation........................cu. yds.	367,886	73,239	220,367	19.9	60.1
Sheeting and bracing............ ft. B. M.	100,000	23,700	39,500	23.7	39.5
Embankment....................cu. yds.	69,040	22,445	33,527	32.6	48.6
White oak sawed lumber......... ft. B. M.	4,000	1,160	2,280	29	57
Foundation piles, 16 ft. long............No.	3,258	514	672	15.8	20.6
Foundation piles, 18 ft. long............No.	4,105	1,573	1,822	38.3	44.1
Foundation piles, 20 ft. long............No.	1,100	15	135	0.7	12.5
Foundation piles, 25 ft. long............No.	10,852	1,956	8,319	18	76.6
Foundation piles, 30 ft. long............No.	350	0	262	0	74.8
Wooden sheet-piling............ ft. B. M.	446,560	152,800	236,400	34.2	52.9
Second-class crushed stone concrete.cu. yds.	*72,912	2,759	4,812	3	5.2
Third-class concrete..............cu. yds.	1,610	746	751	46.4	46.6
Ballast (crushed stone)............cu. yds.	3,000	0	24	0	0.8
Second-class stone paving..........sq. yds.	13,950	2,399	2,715	17.3	19.5
First-class riprap.................cu. yds.	3,990	817	817	20.4	20.4
Second-class riprap...............cu. yds.	6,727	1,442	1,559	21.4	23.2
Third-class riprap.................cu. yds.	700	154	376	22	53.6
Fourth-class riprap...............cu. yds.	10,005	1,489	2,214	14.9	22.1
Iron castings..........................lbs.	33,000	9,890	20,581	30	62.3
Structural steel.......................lbs.	3,743,629	58,725	74,161	1.5	1.9
Metal reinforcement..................lbs.	493,895	151,888	187,377	31.2	38
Shoes and anchorages................each	100	23	23	23	23
Upper lock-gates.....................each	†.034	0	.034	0	100
Swing beams for needle-dams.........each	6	.56	2.32	9.5	38.6
Needles..............................each	186	186	186	100	100
Supports for valve-seats.............each	12	3	8	25	67
Lock-valves..........................each	12	1	4	8.2	33
Second-class gravel concrete.......cu. yds.	*19,000	21,632	45,219	23.6	49.1
Grouted filling....................cu. yds.	4,200	1,306	2,774	32.5	65.9
Gravel ballast.....................cu. yds.	1,000	605	655	60.5	65.5
Removing concrete.................cu. ft.	360	0	360	0	100
Upper lock-gates.....................each	6	1.87	1.94	32.2	32.3
Lower lock-gates.....................each	6	1.60	1.65	27.4	27.5
Emergency piling..................lin. ft.	88,650	32,343	46,449	36.4	52.3

* Second-class gravel concrete estimated as 75,000 cu. yds.; second-class crushed stone concrete estimated as 17,000 cu. yds.

† This amount of work done before type of gate was changed by alterations.

"The work of this residency amounted to $942,000 for the fiscal year. The contractors' average force equals 599 men and 22 teams, working eight-hour shift; their maximum forces equal 822 men and 35 teams, working eight-hour shift. The engineering forces are: One Resident Engineer, 4 Assistant Engineers, 25 Assistants and 6 Inspectors."

Resident Engineer E. A. Lamb reports:

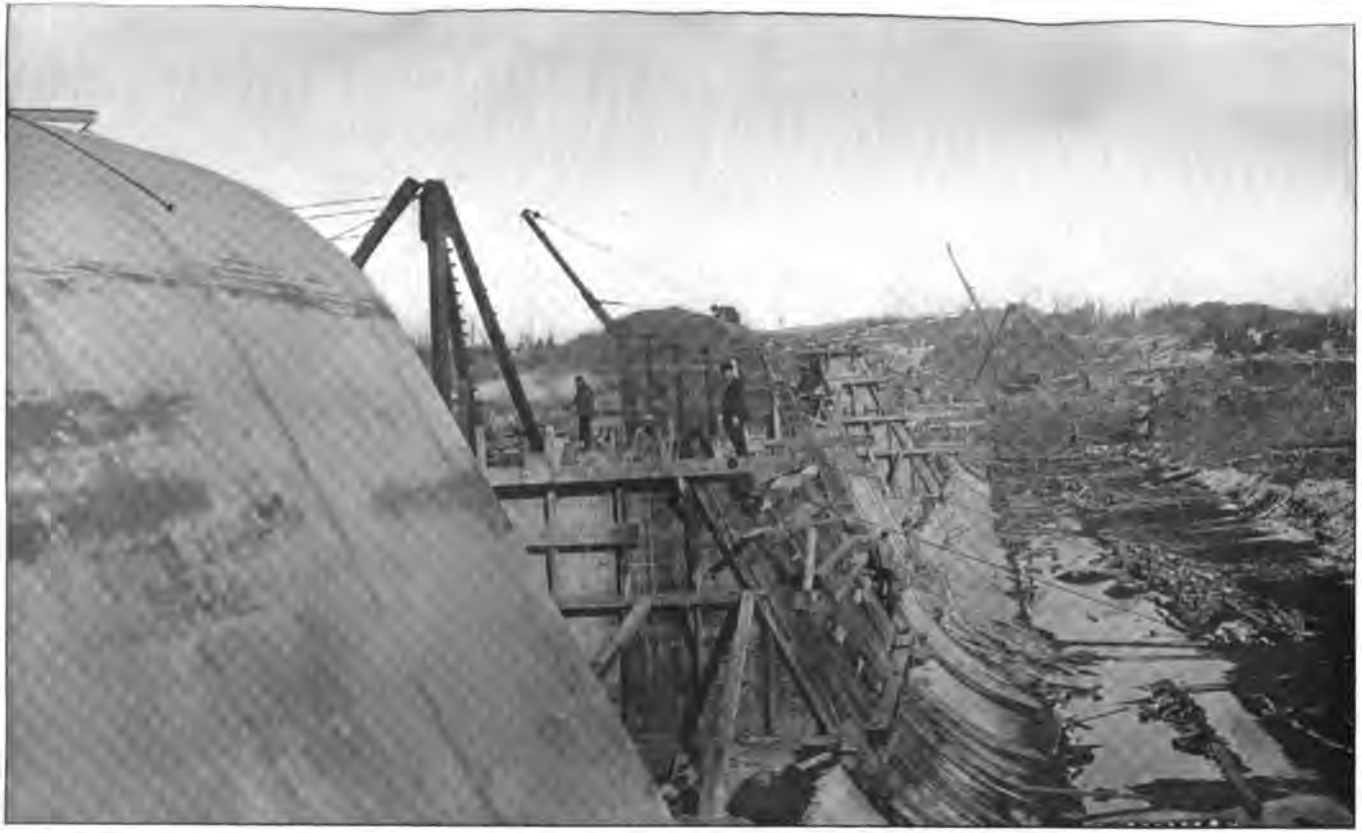
"This residency includes dredging contracts Nos. 20–B, 20–C and 20–D, extending from lock 16, near Mindenville, to deep water just below the aqueduct at Rexford Flats. The total length of the three contracts is 54.2 miles.

"These contracts, 20–B, 20–C and 20–D, together with 20–A, have in different forms been unsuccessfully submitted to bidders several times since October, 1907. The bids upon which the contracts were awarded were opened July 13, 1909. Contract No. 20–B was awarded to S. Pearson & Son, Inc., of Long Island City, N. Y., the contract being executed August 2, 1909. Contracts 20–C and 20–D were awarded to the American Pipe and Construction Co. of Philadelphia, Pa., the contracts being executed August 18, 1909.

"On August 2, 1909, I was assigned to work in charge of contracts Nos. 20–B, 20–C and 20–D, and was instructed to establish an office in the old Guy Park House, Amsterdam, N. Y. A field party, consisting of 1 Assistant Engineer, 1 Rodman, 1 Chainman, 1 Axeman, and 1 Laborer, was sent out about September 1, 1909. The field work has consisted of placing hubs on the base line, corresponding to the stations on the center line of the proposed canal, setting ranges, cross-sectioning some piers near the St. Johnsville bridge and measuring large boulders in the river between Mindenville and Fort Plain.

"*Contract No.* 20–B. During the months of August and September the contractors erected a plant near Fort Plain railroad station for doing some, at least, of the excavation of rock in the prism 'in the dry.' They have also broken, by blasting, the large boulders in the river between Mindenville and Fort Plain, and did about 135 cu. yds. of excavation, consisting of removing stone in old bridge piers near St. Johnsville to Hough creek, to be used for riprap and paving in the stream entrance.

"On September 30, 1909, no work had been done on either contract No. 20–C or contract No. 20–D."



Barge Canal, Contract No. 14.
View of western portion of dam at Vischer's Ferry. Alternate sections completed.

ERIE CANAL, RESIDENCY No. 3.

Resident Engineer F. P. Williams reports:

"The limits of the residency are old lock 27 near Cranesville, at the east end, and old lock 34 near Mindenville, at the west end, covering a length of 34.4 miles along the Mohawk river. This report is of preliminary work executed on this residency and also on contract No. 17 and that portion of contract No. 14 lying within these limits.

"*Surveys.* The surveys for 32 parcels of appropriated lands on the dredging contracts were made during the year. This work has been done by parties on construction work, as time permitted. The engineering work necessary for construction work at the five different locks and dams on the residency has been done as far as the work of the contractors has required, and measurements taken each month for estimates. Gage readings have been taken each Friday at Amsterdam, at St. Johnsville and, until a regular gage-reader was established in the spring, at Canajoharie.

"*Office work.* The appropriation maps for 52 parcels of land on the dredging contracts of the residency have been revised, completed and checked. Completed tracings for 8 parcels at stream entrances, contract No. 20-B, completed tracings for 12 parcels at stream entrances, contract No. 20-C, and completed tracings for 8 parcels at stream entrances, contract No. 20-D, were sent to the head office at Albany. The searches for 70 parcels of appropriated lands have been well advanced toward completion and the assessed values obtained. During the winter months the engineering force has been employed in preparing estimates of construction work done during the season of 1908 in final estimate form. Reports on about half a dozen Court of Claim cases have been prepared.

"On February 1, by direction of the State Engineer and Surveyor, I was placed in charge of the construction work on contract No. 14, Residency No. 3, to succeed Mr. S. M. Savage, who accepted the position of Engineer-Secretary with the Advisory Board of Consulting Engineers.

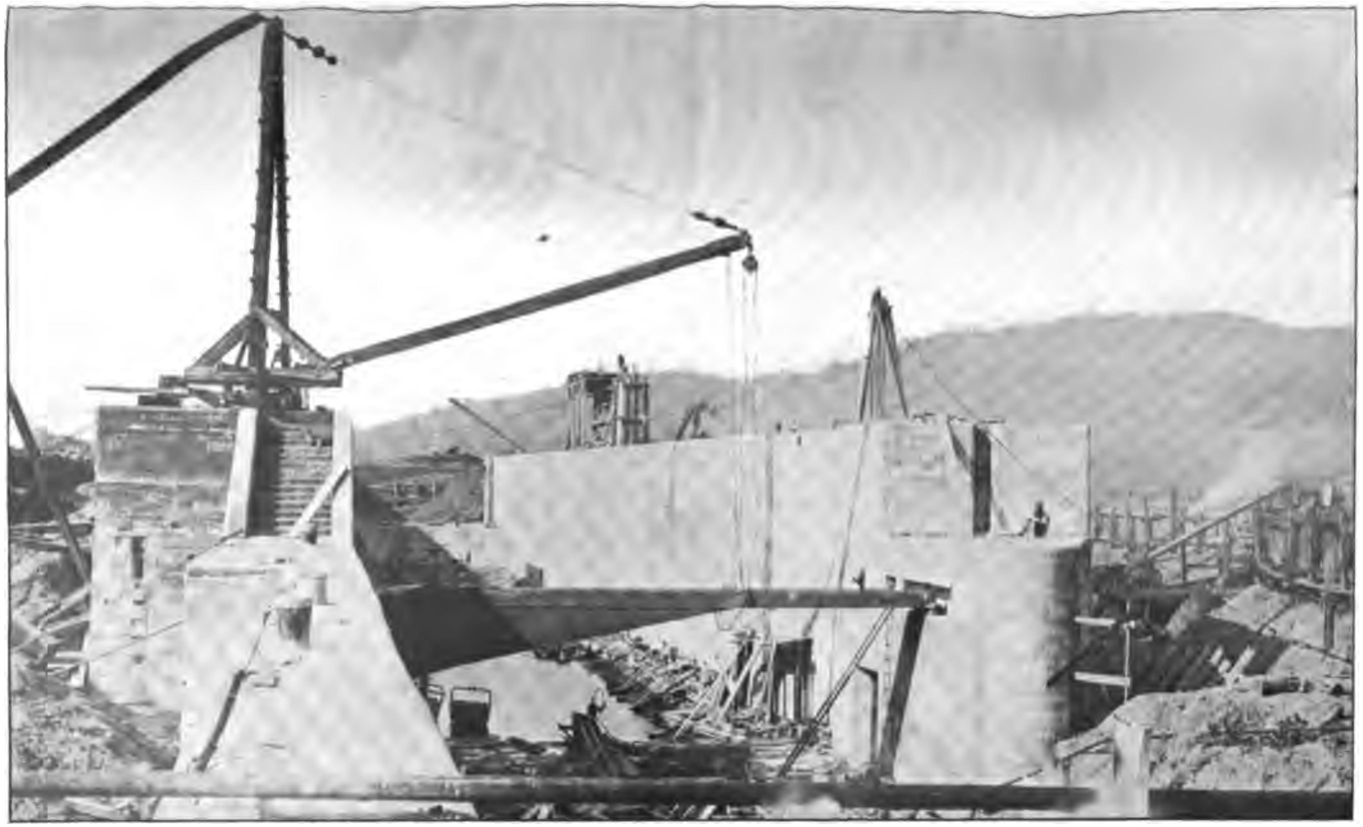
"During the past summer, contracts Nos. 20-B, 20-C and 20-D, comprising the dredging work in the Mohawk river across this residency have been let. Mr. E. A. Lamb, Resident Engineer, has been placed in charge of this dredging work and will report relative to the same.

"*Contract No.* 17. On this work, which includes the construction of dam 7, lock 11, at Amsterdam and dam 8, lock 12, at Tribes Hill, the contractor, Alexander Murdoch, has advanced the work steadily and completed the following:

"At dam 7, lock 11, Amsterdam: The concrete of lock and guide-walls commenced in 1908 has been practically completed. The bank protection and south span of dam, which were in progress of construction last year, were completed during the fall of 1908. The north span of the dam has been completed during the past season. The principal items left to be done at this site are the construction of the middle span of dam and the erection of the steel. The engineering work has been in charge of Mr. M. E. James, Assistant Engineer, and party, at Amsterdam.

"At dam 8, lock 12, Tribes Hill: The south span of dam and pier, which were in progress of construction at the close of last year's report, have been practically completed. The construction of the lock has been rapidly advanced during the present year. The engineering work has been in charge of Mr. A. E. Steere, Assistant Engineer, and party, with an office at Tribes Hill.

"General remarks, contract 17: The contractors have employed extension coffer-dams, a dozen pumps, two steam-shovels, several derricks of different types, pile drivers, dinkeys, cars, a cableway and two different crushing and mixing plants, several steam drills, etc., in progressing this work. Half the contract work has been completed to date. The average daily force employed by the contractors at both sites at the height of the season numbered about 300 men.



Barge Canal, Contract No. 8.
View of lock No. 6, at Cranesville, nearing completion. A pier for a movable dam of bridge type is shown upon the right wall. Also buffer-beams are seen across the ends of the lock.

The following table shows the items of work done, the per-ge completed to date, etc.:

ITEMS OF WORK.	Preliminary estimate as affected by alterations.	Done during year by Alex. Murdoch.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
....	Lump sum.	....	80%	....	80
ation..............cu. yds.	185,336	51,320	127,731	27.7	69
lt holes in rock.....lin. ft.	150	0	100	0	66.0
bracing........ft. B. M.	100,000	56,000	73,849	56.0	73.8
mbankment........cu. yds.	33,000	15,244	17,988	46.2	54.5
................cu. yds.	225	65	156	28.9	69.7
ber, white oak....ft. B. M.	3,000	1,248	1,248	41.6	41.6
piles, 15 ft. long......No.	547	288	495	52.7	90.5
piles, 16 ft. long......No.	1,100	279	931	25.4	84.6
piles, 20 ft. long.....No.	500	0	342	0	68.4
piling.............sq. ft.	700	0	573	0	Finished
et-piling........ft. B. M.	75,000	20,227	58,418	27	77.9
concrete........cu. yds.	49,977	25,006	37,464	50	74.9
concrete.........cu. yds.	1,794	719	1,037	40.1	57.8
..................cu. yds.	7,000	56	56	0.8	0.8
..............cu. yds.	1,021	399	633	40	62
o............cu. yds.	4,200	2,439	3,594	58.2	85.5
............cu. yds.	4,300	2,576	2,787	59.9	64.8
rap.........cu. yds.	5,300	1,967	3,505	37.1	66.1
iprap..........cu. yds.	4,310	1,962	3,046	45.5	70.7
..................lbs.	25,000	11,135	17,951	44.5	71.8
eel.................lbs.	2,617,000	36,180	36,909	1.4	1.4
ment..............lbs.	182,247	97,307	147,317	53.4	80.8
es, dam 7...........No.	38	24	24	63.2	63.2
es, dam 8...........No.	32	16	16	50	50
pports ..No.	8	5	6	62.5	75
	4	21.8% of 1 gate.	21.8% of 1 gate.	5.8	5.5
o.	4	21% of 1 gate.	21% of 1 gate.	5.2	5.2
... ..No.	4	32.1% of one.	45.1% of one.	8.0	11.3

ntract No. 14, *Section* 3: On this work, which includes the ction of dam 9 and lock 13 at Yosts, the construction of 0 and lock 14 at Canajoharie, the construction of dam 11 k 15 at Fort Plain, and the construction of a retaining dam ldenville, the contractors, Acme Engineering and Contract-., have advanced the work rapidly during the year as follows: dam 9, lock 13, Yosts: The land wall and upper guide-wall lock, which were in progress of construction at the close of ar's report, were practically completed in the fall of 1908. the present season the lower guide-wall has been con-l, the upper part of the floor of the lock and the river wall nced, and the excavation for the south span of dam about ted. The subcontractors have employed a hydraulic dredge cavating and pumping, also three large traveling derricks, nsive washing and mixing plant, cars, pumps and sundry r plant in progressing the work. The engineering work has in charge of Mr. E. D. Hendricks, Assistant Engineer, and , at field office on the site.

"At dam 10, lock 14, Canajoharie: The stripping at lock was commenced in the fall of 1908. During the present sea the excavation at lock and guide-walls has been well advanced the concrete for the lower guide-wall completed, the land nearly completed. The excavation work has been difficult on count of the soft nature of the material. The concrete for apron of the north span of dam has been completed and the for the same has been commenced. The contractors have emp a steam-shovel, dinkeys and cars, three large traveling der a concrete mixing plant, pumps, etc., in progressing the work. engineering work has been in charge of Mr. Lewis Bartl sistant Engineer, and party, with office at Canajoharie.

"At dam 11, lock 15, Fort Plain: The work on the nor of dam in progress at the close of last year's report has be vanced and practically completed. The remainder of conc the river wall of lock has been laid and the lower guide-wa structed. The south span of dam has been about comple the pier commenced. The balance of the work remaining done is finishing up small portions of work nearing comp and the steel work, except the lock-gates and needle-beams, have been set. The contractors have employed a cableway, di cars, two large traveling derricks, pumps and sundry small in progressing the work. The engineering work has been in of Mr. Lewis Bartlett, Assistant Engineer, and party, wit office at Fort Plain.

"At Mindenville retaining dam: The work at the Minden retaining dam, which was commenced during 1908, has been vanced and is practically completed, under the direction of sistant Engineer Neuschwander.

"General remarks, contract 14, section 3: The average d force on the four jobs on contract 14, at the height of the seas work, was about 450 men. The river and weather condit have been favorable for river work during the past season.

"General residency remarks: The residency office has been tinued in the old Guy Park House at Amsterdam, appropria by the State for construction purposes.

U of M

"The following table shows the amount of work done, etc., on that portion of contract No. 14 within Residency No. 3:

ITEMS OF WORK.	Preliminary estimate, including alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	$50	....	40%	....	40
All excavation........................cu. yds.	423,165	146,225	217,599	34	51
Sheeting and bracing..............ft. B. M.	83,412	43,122	46,734	52	56
Forming embankment..............cu. yds.	65,877	14,214	14,660	22	22
Sawed lumber, yellow pine.........ft. B. M.	115,890	3,972	27,615	3	24
Sawed lumber, hemlock............ft. B. M.	64,962	7,047	49,094	11	76
Sawed lumber, white oak...........ft. B. M.	7,000	800	6,155	11	87
Stone filling in cribs..............cu. yds.	1,400	179	1,181	13	84
Foundation piles, 10 ft. long.............No.	70	37	37	53	53
Foundation piles, 14 ft. long.............No.	1,500	19	19	1	1
Foundation piles, 16 ft. long.............No.	2,562	650	721	25	28
Foundation piles, 20 ft long.............No.	....	17	96	....	....
Wooden sheet-piling...............ft. B. M.	115,270	38,496	38,496	33	33
Second-class concrete...............cu. yds.	75,199	29,618	35,379	39	47
Third-class concrete.................cu. yds.	1,280	333	472	26	37
Second-class stone paving...........cu. yds.	3,577	120	120	3	3
Third class stone paving............cu. yds.	460	42	42	9	9
Ballast.............................cu. yds.	2,263	382	394	17	18
First-class riprap...................cu. yds.	2,847	150	283	5	10
Second-class riprap.................cu. yds.	7,460	1,370	1,530	18	20
Third-class riprap..................cu. yds.	942	87	87	9	9
Fourth-class riprap.................cu. yds.	8,607	2,153	2,200	25	25
Structural steel.........................lbs.	2,526,966	15,418	19,223	0.6	0.7
Metal in lock-gates.......................lbs	566,400	138,219	138,219	24	24
Metal in needle-dams....................lbs.	246,000	55,050	55,050	22	22
Metal reinforcement.....................lbs.	198,769	38,889	43,035	19	22
Iron castings, plain.....................lbs.	34,900	11,815	11,815	34	34
Iron castings, machined.................lbs.	22,200	11,342	11,342	51	51
Cast iron shoes for uprights..............lbs.	86,000	37,708	37,708	44	44.

ERIE CANAL, RESIDENCY No. 4.

Resident Engineer Philip H. Dater reports:

"Residency No. 4 of the Erie canal extends from a point 2,400 feet east of lock No. 34 of the present canal at Mindenville, Montgomery county, to the west line of Herkimer county at the easterly boundary of the city of Utica. The total length of the Barge canal within the limits of the residency is 27.8 miles. For purposes of construction the work is divided into the following contracts, all of which are let:

"Contract No. 18, land line from ½ mile east of Mindenville to Indian Castle. Length, 3.63 miles. Contract price, $859,460.

"Contract No. 20–A, land line and dredging from Indian Castle to Little Falls. Length, 4.5 miles. Contract price, $490,592.50.

"Contract No. 31, land line through Little Falls. Length, 1.01 miles. Contract price, $829,770.43.

"Contract No. 30, land lines and dredging from Little Falls to Sterling creek. Length, 14.62 miles. Contract price, $2,591,666.50.

"Contract No. 29, land line from Sterling creek to the Oneida-Herkimer county line. Length, 4.0 miles. Contract price, $683,713.66.

"Contract No. 13. The superstructures for two bridges on contract No. 18 are included in this contract.

"These contracts include all the main work to be done on this residency. The following remains to be put under contract: On contract No. 18, temporary locks near East Canada creek and a bridge near Rocky Rift dam; on contract No. 31, the removal of existing locks and the building of one lift and one fixed bridge; on contract Nos. 18, 29, 30 and 31, machinery for operating locks.

"The following statement shows the progress made on construction work and on plans for the various contracts on this residency.

"*Contract No.* 18. This contract begins at the eastern end of the residency and provides for the construction of lock No. 16 at Mindenville, a retaining dam and substructure for a guard-gate at Indian Castle, substructures for two highway bridges, 3.63 miles of standard land line, a temporary canal around lock No. 16 and various incidental structures. The contract was let on December 28, 1906, to the O'Brien & Hoolihan Contracting Co. of Syracuse, N. Y. Work was begun on January 31, 1907. During the year ended September 30, 1909, the following work has been done:

"The masonry for lock No. 16, including the guide-walls and the power house, has been completed. Embankment and stone protection around the lock have been practically completed. Materials for the lock-gates and needle-beams have been delivered, but not erected. The substructures for the two highway bridges and for the guard-gate have been nearly completed. The retaining dam at Castle Creek is finished.

"Excavation by dredge and building embankment has been in progress between Sta. 4020 and the guard-gate, also between Sta. 3919 and Sta. 3951. The dredge work was done under subcontract by the Central Dredging Co. of Cleveland, O. No portion of the prism is entirely completed.

‘ Old bridges Nos. 124 and 126 have been moved to a temporary location during the construction of new bridges and old bridges Nos. 127, 128 and 129 have been removed.

“ Under alteration No. 5 a change of center line has been made between Sta. 3973 and Sta. 4028. The new location is 90 feet north of the old. Under the new plans the tow-path bank along the north side of the existing canal is not removed, thus allowing the excavation to be made without disturbing navigation in the old canal. A portion of the western end of this new location has been excavated this season.

“Alteration No. 6 provides for the use of gravel in place of broken stone in concrete.

“ The progress of the contract work has been slow, but the results are satisfactory. A large amount of steam-shovel excavation along the line of the existing canal is contemplated as soon as navigation closes. The structures on this contract are nearly completed, practically all the remaining work being prism construction. The work is 44.7 per cent completed.

“ This contract was in charge of Mr. Geo. I. Oakley, Assistant Engineer, up to June, 1909, and since June, Mr. E. E. Kendall, Assistant Engineer, has been in charge.

“ The following summary shows the amount of work put under contract and the amount done up to September 30, 1909, including alterations in force and extra work orders:

ITEMS OF WORK.	Preliminary estimate, including all alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing....lump sum.	$500	....	$400	....	80
Grubbing....cu. yds.	24,100	2,713	10,532	11	43.5
All excavation....cu. yds.	944,070	107,000	373,048	11.5	39.5
Embankment....cu. yds.	516,920	15,141	158,519	3	30.5
Lining....cu. yds.	2,140	320	320	15	15
Sawed lumber....M. ft. B. M.	1.7	0	0	0	0
Lumber in miter-sills....M. ft. B. M.	2	0	0	0	0
Sheeting and bracing....M. ft. B. M.	50	11.3	22.8	22.5	45.5
Foundation piles, 13 ft. long....No.	120	0	108	0	90
Poundation piles, 20 ft. long....No.	140	76	104	54.5	74.5
Second-class concrete....cu. yds.	23,918	3,074	22,384	13	Completed
Reinforced concrete....cu. yds.	486	316	378	65	77.5
Grouted filling....cu. yds.	0	0	0	0	0
First-class masonry coping....cu. yds.	5	0	0	0	0
Wash-wall....cu. yds.	30,470	0	0	0	0
Cobblestone paving....sq. yds.	50	0	0	0	0
Ballast....cu. yds.	100	90	90	90	90
Third-class riprap....cu. yds.	150	0	0	0	0
Fourth-class riprap....cu. yds.	2,605	215	549	8.5	21
Structural steel....lbs.	22,640	1,810	14,432	8.	63.5
Metal reinforcement....lbs.	55,594	18,513	29,837	33.5	53.5

ITEMS OF WORK.	Preliminary estimate, including all alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Cast iron pipe, laid ... lbs.	343,000	0	0	0	0
Steel castings ... lbs.	4,000	261	3,650	6.5	91
Iron castings, plain ... lbs.	14,830	1,125	14,508	7.5	98
Iron castings, machined ... lbs.	9,000	0	8,150	0	90.5
Wooden fencing ... lin. ft.	3,448	0	0	0	0
Upper lock-gates ... No.	2	0.01	0.09	0.5	4.5
Lower lock-gates ... No.	2	0.07	0.095	3.5	4.75
Upper needle-dam ... No.	1	0	0.07	0	7
Lower needle-dam ... No.	1	0.06	0.06	6	6
Lock-valves ... No.	4	0.36	0.36	9	9
Removal of bridge superstructure ... No.	11	3.5	8.5	32	77
Maintaining traffic ... lump sum	$2,000	$300	$800	15	40
Deduct for buildings removed ... lump sum	$3,000	0	$3,000	0	100
Deduct for sheeting and bracing previously used ... ft. B. M.	10,343	10,343	10,343	100	100
Second-class concrete in place of grouted filling	950	61	894	6.5	Completed
Second-class gravel concrete ... cu. yds.	4,240	1,135	1,135	26.5	26.5
Extra Work.					
Lining temporary canal ... cu. yds.	...	0	252	0	100
Steel sheet-piling ... sq. ft.	...	0	8,000	0	100
Preparation of 200 sand bags ... lump sum	.	0	$32	0	100
Lining temporary tow-path ... cu. yds.	...	0	1,000	0	100
Widening approach, temporary canal. cu. yds.	..	0	2,172	0	100
Laying pipe to drain water from cellars ...	...	0	$1,144	0	100

"*Contract No.* 13. This contract includes in part the superstructures for two highway bridges on contract No. 18. The contract was let on November 7, 1908, to the Penn Bridge Co. of Beaver Falls, Pa. The steel work has been fabricated in the shops, but none of it has been erected.

"*Contract No.* 20–A. This contract begins at the west end of contract No. 18 and extends to the east end of contract No. 31 at Little Falls. The work includes 0.7 mile of land line at the eastern end and 3.8 miles of dredging in the Mohawk river between Rocky Rift dam and Little Falls. The contract was let on August 20, 1909, to Houston Barnard, of Rochester, N. Y. Work has not been begun.

"*Contract No.* 31. This contract provides for the construction of lock No. 17, a guard-gate, bridge, retaining walls and one mile of land line through the city of Little Falls and for the building of a movable crest on the Rocky Rift dam and the superstructure of the Indian Castle guard-gate. This contract was let on September 2, 1908, to Casey & Murray, of Rochester, N. Y. Work was begun on September 12, 1908.

"The south wall of lock No. 17 and a timber tow-path around it were built during the winter, thus avoiding the use of a coffer-dam in the bed of the old canal. During the summer excavation for the north wall and lock chamber has been carried nearly to completion, the north wall being ready for concrete. Most of the excavation from the lock was dumped in the large spoil bank in the river near Sta. 4305.

" Excavation of rock for prism has been made from Sta. 4307 to Sta. 4313, the stone being crushed for concrete use. The retaining wall on the north side of the canal from Sta. 4301 to Sta. 4305 has been built and work begun on the wall running westward from Sta. 4308.

" During the winter of 1908 the high cliff on the south side of the canal from Sta. 4317 to Sta. 4322 was excavated and the wall along the north side opposite to it was nearly completed. This work was done by the P. B. McCaghey Co. of Little Falls under subcontract.

" The western end of the contract from old lock No. 38 to Hansen Ave. bridge has been sublet to Lathrop, Shea & Henwood, of Buffalo, N. Y. Their work has consisted of building the retaining wall along the north side of the old feeder from Bellinger St. to Hansen Ave., some excavation of prism, building Hansen Ave. bridge and approaches, raising the river bridge leading to Hansen island and drilling rock preparatory to winter excavation with steam-shovel.

" Under an extra work order dated May 5, 1909, fenders have been placed on the timber tow-path around lock No. 17.

" The following alterations have been put in force: No. 1, changing the size of broken stone; No. 2, modifications of power house at lock No. 17.

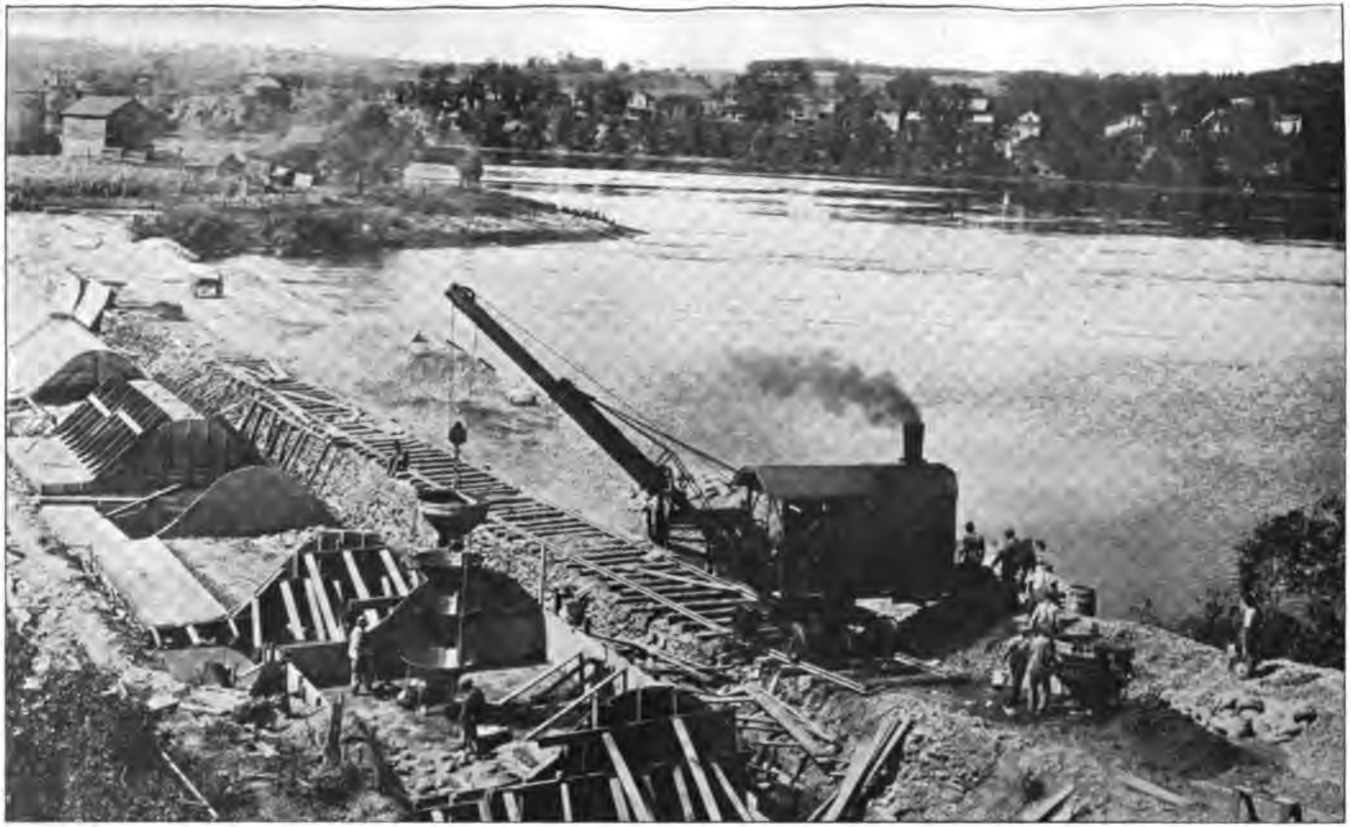
" Progress on this contract has been rapid and the work good. The percentage of work done to date is 34.3, which is 7 per cent ahead of the elapsed time.

" The engineering work on this contract has been in charge of Mr. Frederick W. Harris, Assistant Engineer.

"The following summary shows the amount of work put under contract and the amount done up to September 30, 1909, including alterations in force and extra work orders:

ITEMS OF WORK.	Preliminary estimate, including all alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing ... lump sum	$100	$50	$50	50	50
Excavation ... cu. yds.	244,038	89,899	89,899	37	37
Removal of dam masonry ... cu. yds.	250	0	0	0	0
Round bracing ... lin. ft.	1,000	0	0	0	0
Sheeting and bracing ... M. ft. B. M.	30	0	0	0	0
Channeling ... sq. ft.	43,000	0	0	0	0
Embankment ... cu. yds.	15,800	1,542	1,542	10	10
Lining ... cu. yds.	3,320	328	328	10	10
Puddle ... cu. yds.	740	136	136	18.5	18.5
Sawed lumber ... M. ft. B. M.	76	53.9	53.9	71	71
Lumber in miter-sills and gates. M. ft. B. M.	4.5	0	0	0	0
Lumber in needles ... M. ft. B. M.	7	0	0	0	0
Round timber ... lin. ft.	5,300	2,598	2,598	49	49
Second-class concrete ... cu. yds.	57,160	26,180	26,180	46	46
Reinforced concrete ... cu. yds.	387	127	127	33	33
First-class masonry coping ... cu. yds.	3	0	0	0	0
Dry retaining wall ... cu. yds.	9,240	1,273	1,273	14	14
Third-class stone paving ... sq. yds.	168	37	37	22	22
Cobblestone paving ... sq. yds.	180	0	0	0	0
First-class riprap ... cu. yds.	230	0	0	0	0
Fourth-class riprap ... cu. yds.	12,400	993	993	8	8
Structural steel ... lbs.	155,485	119,013	119,013	76.5	76.5
Metal reinforcement ... lbs.	100,940	29,956	29,956	29.5	29.5
Iron castings, plain ... lbs.	26,800	10,679	10,679	40	40
Iron castings, machined ... lbs.	13,000	6,324	6,324	48.5	48.5
Metal in upper lock-gates ... lbs.	138,000	3,687	3,687	2.5	2.5
Metal in lower lock-gates ... lbs.	430,000	546	546	0.1	0.1
Metal in buffer-beams ... lbs.	80,000	2,641	2,641	3.5	3.5
Metal in lock-valves ... lbs.	60,000	0	0	0	0
Metal in guard-gates ... lbs.	680,000	206	206	0.03	0.03
Wooden fence ... lin. ft.	1,500	330	330	22	22
W. I. pipe railing ... lin. ft.	1,080	0	0	0	0
Lattice railing ... lin. ft.	184	114	114	62	62
Filling seams ... lin. ft.	2,500	0	0	0	0
Repointing old masonry ... lin. ft.	3,000	1,395	1,395	46.5	46.5
Storehouses ...	$800	0	0	0	0
Coffer-dams, pumping, etc ...	$1,000	0	0	0	0
Drilling bolt holes in rock ... lin. ft.	600	0	0	0	0
Raising bridge superstructures ...	$1,800	$1,800	$1,800	100	100
Maintaining traffic ...	$1,000	0	0	0	0
Maintaining navigation ...	$1,000	0	0	0	0
Deduct for buildings removed ...	$3,500	$3,500	$3,500	100	100
Deduct for bridge superstructures removed ...	$50	$25	$25	50	50
Extra Work.					
Bracing timber towpath ...	....	$451	$451	100	100

"*Contract No.* 30. This contract extends westward from contract No. 31 and includes 3.7 miles of river line to Jacksonburg, 4.1 miles of land line to Herkimer, 4.5 miles of river line to Frankfort and 3 miles of land line to the eastern end of contract No. 29 at a point ½ mile east of Sterling creek. The contract includes lock No. 18 at Jacksonburg, a guard-gate and a movable dam at Herkimer, a retaining dam at Frankfort, five bridges and incidental work. The contract was let on July 16, 1909, to the Acme Engineering and Contracting Co. of Schenectady, N. Y.



BARGE CANAL, CONTRACT No. 68.
View of low dam under construction, near Stillwater; built to divert the river into its main channel during navigable stages, thus preventing rapids in the Barge canal channel.

" No contract work has been done, but a large number of the appropriation surveys have been completed. Mr. Geo. I. Oakley, Assistant Engineer, is in charge of the engineering on this contract, with an office at Herkimer, N. Y.

" *Contract No.* 29. This contract begins at the western end of contract No. 30 and includes 4 miles of land line, the western end being at the eastern boundary of the city of Utica at the Oneida-Herkimer county line, which is also the western limit of the residency. The contract includes lock No. 19 at Sterling creek, two spillways, a dam, two large culverts and two bridges. The contract was let on April 3, 1909, to the Maryland Dredging & Contracting Co. of Baltimore, Md.

" Work was begun in June. The prism has been excavated from the western end of the contract for about ¾ of a mile. The substructure of the West Schuyler bridge has been completed and some work done on minor structures. The entire right-of-way line has been monumented. The contract is 4.5 per cent completed.

" The engineering on this contract is in charge of Mr. Maurice W. Williams, Assistant Engineer. The office is at Frankfort.

" The following summary shows the amount of work put under contract and the amount done up to September 30, 1909.

ITEMS OF WORK.	Preliminary estimate.	Preliminary estimate, including all alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing....................lump sum	$500	$500	0	0	0	0
Grubbing....................cu. yds.	32,000	32,000	14,006	14,006	43.5	43.5
Excavation....................cu. yds.	1,181,000	1,181,000	101,985	101,985	8.5	8.5
Sheeting and bracing.......M. ft. B. M.	60	60	5.6	5.6	9.5	9.5
Round timber bracing...........lin. ft.	1,000	1,000	0	0	0	0
Embankment....................cu. yds.	309,000	309,000	11,004	11,004	3.5	3.5
Lining....................cu. yds.	2,370	2,370	0	0	0	0
Sawed lumber.............M. ft. B. M.	9	9	0	0	0	0
Lumber in miter-sills and gates.........M. ft. B. M.	8	8	0	0	0	0
Foundation piles....................lin. ft.	85,140	85,140	1,280	1,280	1.5	1.5
Wooden sheet-piling........M. ft. B. M.	43	43	0	0	0	0
Steel sheet-piling....................sq. ft.	1,000	1,000	0	0	0	0
Second-class concrete...........cu. yds.	32,500	32,500	405	405	1	1
Reinforced concrete............cu. yds.	175	175	1	1	0.6	0.6
First-class masonry coping......cu. yds.	4	4	0	0	0	0
Wash-wall....................cu. yds.	32,000	32,000	0	0	0	0
First-class stone paving.........sq. yds.	2,030	2,030	0	0	0	0
Third-class stone paving........sq. yds.	900	900	0	0	0	0
First-class riprap..............cu. yds.	210	210	0	0	0	0
Second-class riprap............cu. yds.	1,530	1,530	0	0	0	0
Third-class riprap..............cu. yds.	600	600	0	0	0	0
Fourth-class riprap.............cu. yds.	5,900	5,900	0	0	0	0
9-in. vitrified pipe, laid..........lin. ft.	31	31	0	0	0	0
30-in. vitrified pipe, laid.........lin. ft.	75	75	0	0	0	0
Structural steel....................lbs.	233,000	233,000	0	0	0	0
Metal reinforcement................lbs.	90,400	90,400	2,003	2,003	2	2
Iron castings, plain................lbs.	13,600	13,600	0	0	0	0

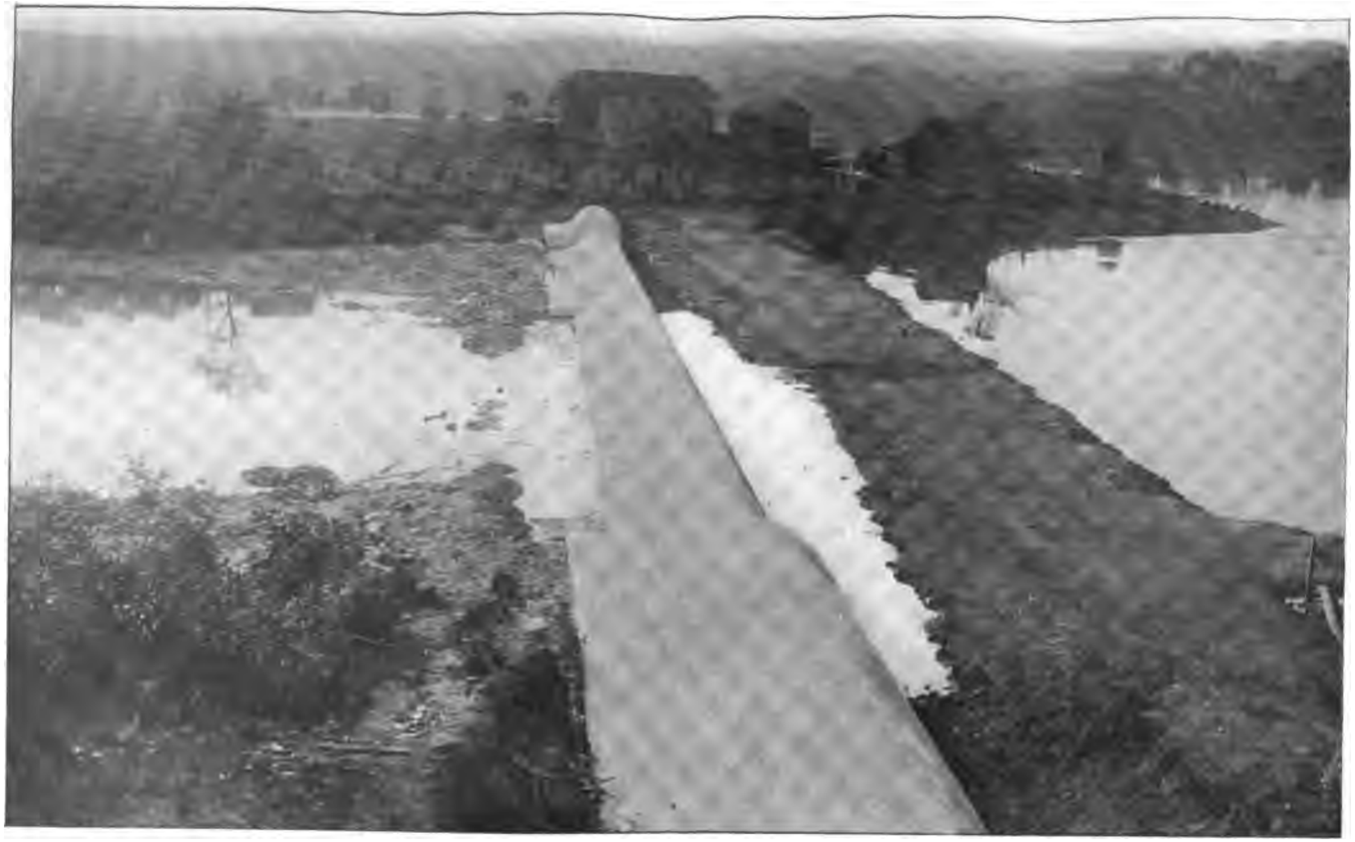
ITEMS OF WORK.	Preliminary estimate.	Preliminary estimate, including all alterations.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Iron castings, machined............lbs.	8,500	8,500	0	0	0	0
Metal in lock-gates.....................lbs.	250,000	250,000	0	0	0	0
Metal in buffer-beams..................lbs.	78,000	78,000	0	0	0	0
Metal in lock-valves....................lbs.	35,000	35,000	0	0	0	0
Wooden pavement..............sq. yds.	560	560	0	0	0	0
Wooden fence........................lin. ft.	2,800	2,800	0	0	0	0
Maintaining traffic..........lump sum	$1,000	$1,000	$350	$350	35	35
Storehouse.....................lump sum	$800	$800	0	0	0	0
Office building................lump sum	$250	$250	$188	$188	75	75
Coffer-dams, pumping, bailing and draining.......................lump sum	$7,500	$7,500	0	0	0	0

"In addition to the above contract work the following miscellaneous work has been done. Appropriation surveys on contract No. 29 have been completed and are well under way on contract No. 30. Additional appropriation surveys have been made on contracts Nos. 18 and 31. A small amount of center line has been relocated, topography taken and drive rod soundings made. Weekly gage readings along the Mohawk river have been taken throughout the year.

"The following tabular statement shows the condition of the preliminary work on this residency. There should be very little increase in any of these items, as the work on this residency is now all under contract:

Tabular Statement of Preliminary Work.

ITEMS.	Reported Sept. 30, 1908.	Sept. 30, 1908, to Sept. 30, 1909.	Total to date.
Transit line.......................miles	177	10	187
Levels (including cross-sections).......miles	223	2	225
Borings (wash-drill, drive-rod and earth auger).......lin. ft.	27,220	250	27,470
Borings (Calyx drill and test pits).......lin. ft.	460	50	510
Topography.......................sq. miles	4	1	5
White paper plans (1 inch = 100 feet).......miles	33	0	33
Cross-sections.......................miles	45	0	45
Contract tracings.......................miles	28	0	28
Estimates, preliminary.......................miles	28	0	28
Estimates, contract.......................miles	28	0	28
Appropriation surveys.......................miles	10	10	20
Appropriation plans.......................miles	7	12	19
Blue line surveys.......................miles	12	10	22



Barge Canal, Contract No. 68.
View of the completed diverting dam at Stillwater.

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CHAMPLAIN CANAL, RESIDENCY NO. 1.

Resident Engineer Frank N. Sanders reports:

"This residency extends from the State dam at Troy to the change bridge just above old lock No. 10, near the Northumberland dam, Washington county, a length of about 27 miles.

"The work done has consisted of preliminary work for the purpose of comparative estimates, preparation of contract drawings and supervision of construction. During the year a subdivision of contracts Nos. 69 and 70 was made, in order to expedite their being placed under construction. The present numbers of contracts in this residency are as follows: Contract No. 68, for the construction of locks Nos. 3, 4 and 5; contract No. 69, for the construction of lock No. 2; contract No. 70, for dredging the Hudson river between Waterford and lock No. 1; contract No. 71, for dredging the Hudson river between lock No. 1 and lock No. 2 and for the construction of lock No. 1 and dam No. 1; contract No. 72, for dredging the Hudson river between lock No. 2 and lock No. 4; contract No. 73, for dredging the Hudson river between lock No. 4 and lock No. 5 and also the construction work north of lock No. 5 between contracts Nos. 1 and 68; and contract No. 74, for the dredging of the canal channel between the Hudson river and lock No. 2 at Waterford.

"During the early part of the year a comparative estimate was made to determine whether lock No. 3 could be constructed more advantageously by shifting it to the east and passing through a land cut instead of cutting the dam of the West Virginia Pulp and Paper Company, as the plans for contract No. 68 provided. All the necessary sections, quantities and computations were made, the result being in favor of the old line. Another comparative estimate was made to see if it would be advisable to construct lock No. 2 in a land cut between the highway and the plant of the Hudson River Electric Power Company, instead of through the island immediately east of the power house, as was originally planned. All the necessary field work was done, including borings, river soundings, cross-sections, etc. This was followed by the office work to determine the comparative cost. It was found that if this land line should be used the grade between lock No. 1 and lock No. 2 would have to be lowered 2.5 feet to prevent the back water from the proposed dam No. 1 submerging the wheel-pits of the power company. It was finally decided to construct the lock in the location first proposed, the lower grade being excavated 1.7 feet deeper than originally planned, the computations showing that with this grade and the spoil banks removed from the river, the water conditions at the power plant would remain unchanged.

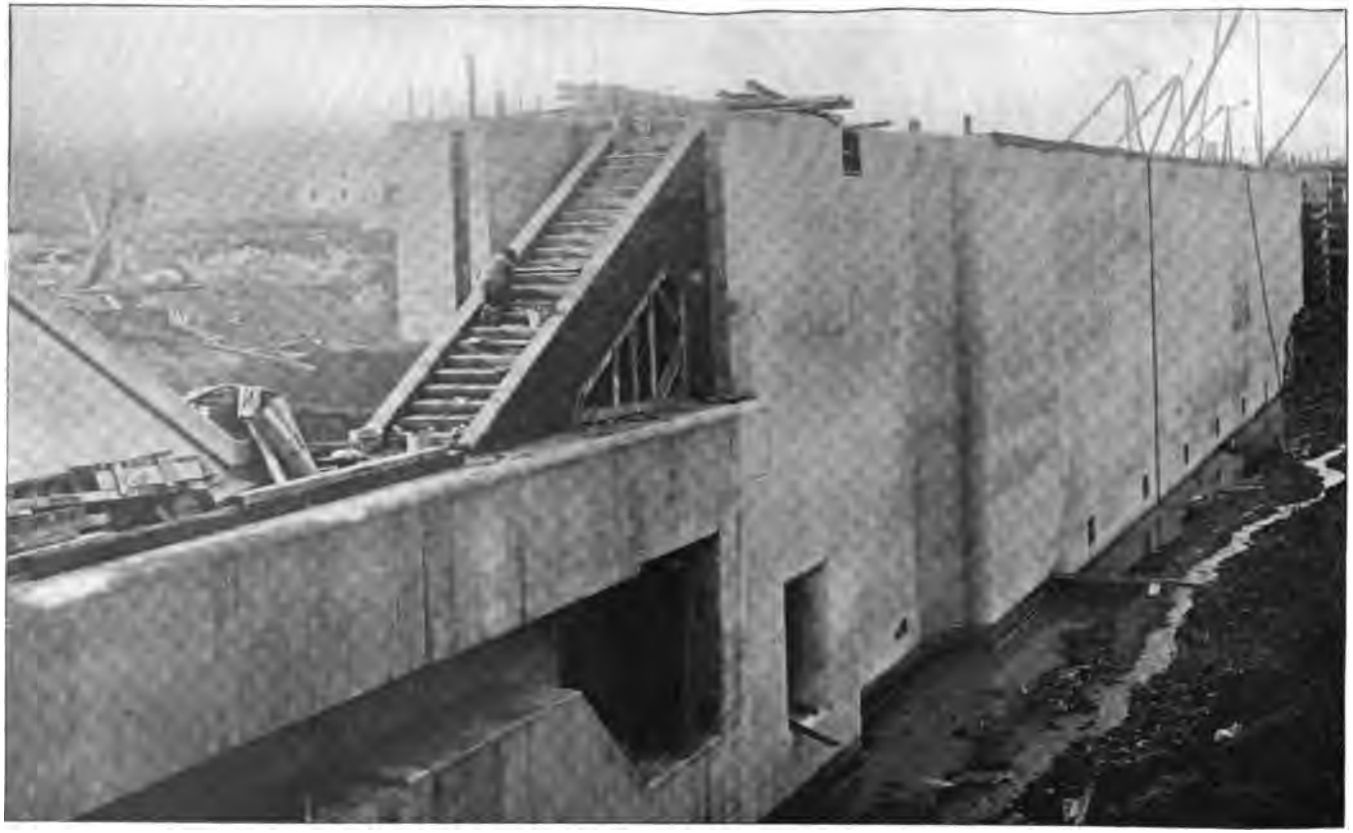
"In the preparation of plans for new contracts considerable work has been done. Water slopes have been computed for the maximum navigable stage and for flood elevations the entire length of canal in this residency, and between lock No. 1 and lock No. 2 water slopes have been computed for a number of discharges, using several different elevations of crest for dam No. 1.

"Spoil banks generally have been removed from the river channel and areas provided on land for the disposition of the same, the excavation quantities being refigured with a factor of expansion of 0.9 for rock, instead of 0.5 formerly used, as the material excavated under contract No. 68 showed that the shale rock in the banks occupied more space than was supposed would be the case.

"*Plans prepared.*— The tracings and computations for Contracts Nos. 70, 71 and 72 were finished and sent to the Barge Canal Office in Albany during September, 1909. The work done on these contracts included making a number of new tracings and for Contract No. 71 all previous work was revised to conform with the new grade of 17.5 instead of 19.2. Work on the plans for Contract No. 73 is progressing rapidly and they will be sent to Albany shortly. On Contract No. 73 considerable new work has been added near Northumberland, north of Lock No. 5.

"*Field work.*— Appropriation surveys and maps were made in January of all lands appropriated under contract No. 68.

"*Contract No.* 68 was let November 17, 1908, to Shanley-Morrissey, Inc., New York city. It calls for the construction in the



Barge Canal, Contract No. 68.
View of west wall of lock No. 5, Champlain canal, at Northumberland.

Hudson river of lock No. 3 at Mechanicville, lock No. 4 at Stillwater and lock No. 5 at Northumberland, together with accompanying land lines and all appertaining construction, with a length of about 1.4 miles. The contract price is $1,018,323 and it is to be completed April 15, 1912. At the present writing, September 30, 1909, the contract is 32.15 per cent completed, being 8.4 per cent ahead of the schedule.

"At lock No. 5 the contractor began operations in January by excavating with a steam-shovel in the upper prism. As the season advanced this work was discontinued to permit the trolley tracks to be relocated and excavation for the lock and approach walls started. Concreting began the first week in June and progressed rapidly all summer. At the end of September the entire west lock wall had been completed and about half of the upper and lower guide-walls, also about 340 feet of core-wall east of the lock site.

"At lock No. 4 the steam-shovel started work in the upper prism March 1 and has worked continually, so that at the end of September the entire upper prism has been excavated and most of the material from the lock site removed. Well drills were used. Concrete was first placed in the dam between Bulson and Parry's islands on August 18, the dam being completed September 24.

"At lock No. 3 during the month of June the contractor placed flash boards on the dam and also cribs for his lower coffer-dam. Excavation for the west chamber wall began July 20, and the first concrete was laid October 1.

"A. C. Richards, R. D. Hayes and L. T. Howard, Assistant Engineers, have been in charge of locks Nos. 3, 4 and 5, respectively.

"The following is a summary of the work done under this contract:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing……lump sum	$100	$100	$100	100	100
Grubbing……cu. yds.	4,800	2,774	2,774	57.8	57.8
Excavation……cu. yds.	550,000	394,895	394,895	71 8	71.8
Sheeting and bracing……ft. B. M.	50,000	12,470	12,470	24.9	24 9
Round timber bracing……lin. ft.	1,000	609	669	66.9	66.9
Channeling……sq. ft.	170,000	……	……	……	……
Embankment, wet……cu. yds.	30,000	7,413	7,413	24.4	24.4
Embankment, dry……cu. yds.	43,000	26,453	26,453	61.5	61 5
Lining……cu. yds.	510	0	0	0	0
Sawed lumber (yellow pine or Douglas fir)……M. ft. B. M.	5 6	0	0	0	0
Sawed lumber in needles……M. ft. B. M.	14	0	0	0	0
White oak lumber in miter-sills and gates……M. ft. B. M.	25	0	0	0	0
Foundation piles……lin. ft.	3,000	0	0	0	0
Second-class concrete……cu. yds.	68,000	11,871	11,871	17.4	17 4
Reinforced concrete……cu. yds.	1,500	0	0	0	0
First-class masonry coping……cu. yds.	5	0	0	0	0
Wash wall……cu. yds.	2,000	0	0	0	0
Third-class stone paving……sq. yds.	72	0	0	0	0
Fourth-class riprap……cu. yds.	200	0	0	0	0
Structural steel……lbs.	180,000	5,886	5,886	3.3	3.3
Metal reinforcement……lbs.	61,000	875	875	.14	.14
Iron castings, plain……lbs.	28,000	421	421	1.5	1 5
Iron castings, machined……lbs.	26,000	2,025	2,025	7.8	7 8
Metal in lock-gates……lbs.	770,000	0	0	0	0
Metal in buffer-beams……lbs.	240,000	0	0	0	0
Metal in lock-valves……lbs.	100,000	0	0	0	0
Wooden pavement, 4-in. thick……sq. yds.	300	0	0	0	0
Wooden fence……lin. ft.	1,150	0	0	0	0
Drilling bolt holes in rock……lin. ft.	1,300	0	0	0	0
Raising bridge superstructure……lump sum	$2,000	0	0	0	0
Maintaining highway traffic……lump sum	$2,000	0	0	0	0
Three storehouses……each	$800	0	0	0	0
Two office buildings……each	$250	2	2	100	100
Coffer-dams, pumping, bailing and draining……lump sum	$25,000	$3,187	$3,187	12 7	12.7

CHAMPLAIN CANAL, RESIDENCY NO. 2.

Resident Engineer E. V. R. Payne reports:

"*Contract No.* 1.

"For excavating the river channel from Northumberland to Fort Miller and from Crocker's Reef to Fort Edward; the construction of the Crocker's Reef dam and the approaches to the head and foot of 'the land line' and other incidental work. Length, 7.075 miles. Contractor, Empire Engineering Corporation. Engineer in charge for the State, Harry Shoemaker, Assistant Engineer.

"*Excavation.* The dipper-dredge *Pontiac* was out of commission from Sept. 30, 1908, to Oct. 5, 1908, undergoing repairs. It resumed work in land line at Crocker's Reef, dredging along the foot of the slopes until November 1, when it was taken out of the river and shipped to the Western Division via Champlain and Erie canals. From Sept. 30 to Dec. 1, 1908, the dipper-dredge *Peconic* dredged at various points from Fort Miller to Northumberland, when it was taken to winter quarters in lower approach to lock No. 6 at Fort Miller. It resumed work on April 10, 1909, and on April 16 high water necessitated the shutting down of dredge until the 19th. It again started and worked until May 20, at which time it was stopped on account of lack of broken rock to excavate. It was the plan to utilize the rock to fill the cribs being constructed at Fort Miller, the rock being an indurated sandstone very difficult to break with the Lobnitz machine. The dredge continued and is working at the end of the fiscal year. The total amount of excavation for the year, by the dredges, was 25,924 cubic yards. This comparatively small amount was due to the fact that a large percentage of the excavation was broken rock.

"The wash-wall notch in the land line at Crocker's Reef was excavated by a revolving crane mounted on a scow, operating an orange peel bucket, and partly by hand.

"Some 2,548 cubic yards were excavated from borrow pits at Crocker's to form embankment along the land line.

"A rock ledge along the west side of the land line was too high to break with the Lobnitz machine, and a small force of men worked with steam-drills at this point from Nov. 26, 1908, to February 19, 1909, when the drills were moved to the rock ledge at the south end of the lower approach walls to lock No. 6 at Fort Miller, and the work was continued there until March 19, 1909, loosening this ledge which the rock-breaker could not reach.

"All surplus material excavated north of Crocker's was deposited in the spoil area back of Billings island. Between Fort Miller and Sta. 44 + 00 spoil was deposited along the east shore of the river and below Sta. 44 + 00 spoil was placed in the deep hole south of the Northumberland bridge, shown on the plan as a area.

“The Lobnitz rock-breaker operated from Sept. 30 to De 1908, on the various ledges between Fort Miller and Nort berland, and was then put in winter quarters in lower appro lock No. 6. It resumed work March 24, 1909, and continue intervals during the year on this south section of the cont From April 14 to April 24 the high water in the river caus shut-down of the breaker, and at numerous times during the the plant was shut down on account of broken hammers, points sockets for the points. It is estimated that 10,000 cubic yar rock were broken by this machine during the season.

“*Embankment.* 4,600 cubic yards of embankment were pl along either side of the land line at Crocker's Reef, comple about 95 per cent of the embankment on this contract.

“*Timber Cribs.* Nine round timber cribs for the lower appr to lock No. 6 were started April 1, 1909, the bottoms of w were framed on shore and towed into position along the east of the prism in line with the east approach wall. The round ber work is practically completed and 79 per cent of the squ timber face for the cribs has also been placed. They will finished during the present season, which will complete the ite of stone filling on this contract.

“*Wash-wall.* 88 per cent of the wash-wall on this contract is i place. No coping has been laid and the balance of the wash-wal cannot be placed until the bulkhead between contracts Nos. 1 and at Crocker's is removed. This represents about 225 lin. ft. of wash-wall to be placed on the slopes at the south end of the land line.

“*Breakwater Pier.* The concrete pier at entrance to the land line at Crocker's is completed and no settlement has been detected recently.

“*First-class Riprap.* 150 cubic yards of first-class riprap was placed around the north end of the concrete breakwater pier under the original contract.

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"*Second-class Riprap.* Under an extra work order second-class riprap was placed around the north end of the concrete breakwater pier at the entrance to the Crocker's land line and along the shore of the river at the south end of the pier to protect the bank. Work was started about January 1, 1909, and completed February 19, 1909. About 2,400 cubic yards of stone were used.

"The following is a summary of the items on contract No. 1 as they stand on September 30, 1909, as modified by all alterations to date:

ITEMS OF WORK.	Preliminary estimate.	Quantities as modified by alterations, 1, 2, 3, 5, 6.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing....................lump sum	1	1	0	45%	0	45
Grubbing....................cu. yds.	2,400	2,400	0	2,366	0	90.9
All excavation....................cu. yds.	913,500	868,450	28,722	687,317	3.8	92.1
Forming embankment..........cu. yds.	26,000	26,000	4,683	24,657	18	94.8
Yellow pine timber............ft. B. M.	90,000	85,000	42,443	66,617	49.9	78.4
Round timber..................lin. ft.	70,750	68,950	26,486	65,343	38.4	100
Iron and steel fastenings..........lbs.	3,500	3,500	0	308	0	100
First-class concrete............cu. yds.	1,000	1,000	0	828	0	100
Second-class concrete..........cu. yds.	4,110	4,065	0	3,449	0	100
Third-class concrete............cu. yds.	300	300	0	331	0	100
Wash-wall, including coping.....cu. yds.	7,750	7,750	1,719	5,906	22.2	88.2
Stone filling in cribs............cu. yds.	6,250	7,757	3,364	7,442	45.2	100
First-class riprap..............cu. yds.	326	326	149	241	61.8	100
(*Extra work order dated Nov. 24, 1908.*)						
Second-class riprap............cu. yds.	2,000	....	2,423	2,423	100	100
(*Extra work order dated Oct. 3, 1908.*)						
Excavation....................cu. yds.	....	....	10.9	10.9	100	100
Second-class concrete..........cu. yds.	....	....	6.5	6.5	100	100
Iron pipe........................tons	....	....	2.5	2.5	100	100
Stone paving..................sq. yds.	....	....	4.6	4.6	100	100

"*Contract No. 3.*

"For the excavation of the canal and the protection of its banks from Sta. 147 + 75, below lock No. 6 at Fort Miller, to Sta. 262 + 00, above the guard-gate at Crocker's Reef; the construction of lock No. 6 and its approaches, the guard-gate and its approaches, the bridge abutments and foundations at Sta. 151 + 60, Sta. 173 + 18, Sta. 213 + 46 and Sta. 247 + 50; the removal and reërection of the present bridge at East street; the change in location of the old Champlain canal and all other incidental work. Contractors, Sundstrom & Stratton. Engineer in charge for the State, C. A. Curtis, Assistant Engineer.

"*Excavation.* This contract covers about 2.16 miles of canal in land line, connecting the Northumberland–Fort Miller pool with the Crocker's–Fort Edward pool, and is located on the east side of the Hudson river between Fort Miller and Crocker's Reef. Excavation for the canal prism was begun in April, 1905, and excepting a small amount of excavation made by teams and graders, the work was done by steam-shovels and side dump cars. During the past season teams and slip scrapers, with wagons loaded by hand, and a small travelling stiff-leg derrick were used. The material so excavated was spoiled east of the Barge canal, except a small amount of trimming, which was spoiled along the back slope of the west embankment.

"The walls of lock No. 6 and its approaches were backfilled with embankment taken from borrow-pits, one being located on the east side of the old Champlain canal opposite the lock, the other on the west side of the Barge canal north of Ridge road bridge. From this borrow-pit a ditch was dug, connecting it with the two swamps on the Payne farms, in order to provide drainage for them to the river opposite Ridge road.

"All excavation and embankment were practically completed at this time, except trimming slopes and leveling spoil banks, which is under way. Work closed down for the year on December 31, 1908.

"*Wash-wall.* Placing wash-wall and excavating the bottom of canal prism and trimming slopes, has taken the entire force from May 2, 1909, to date. The stone for the wash-wall was quarried at Flat Rock, north of Fort Ann, and delivered in boats to the unloading plant at Payne's bridge. Here the cars were loaded by derricks and the stone delivered to the wash-wall notch by tracks along the top of the embankment on both sides of the canal. The wash-wall is about 90 per cent complete.

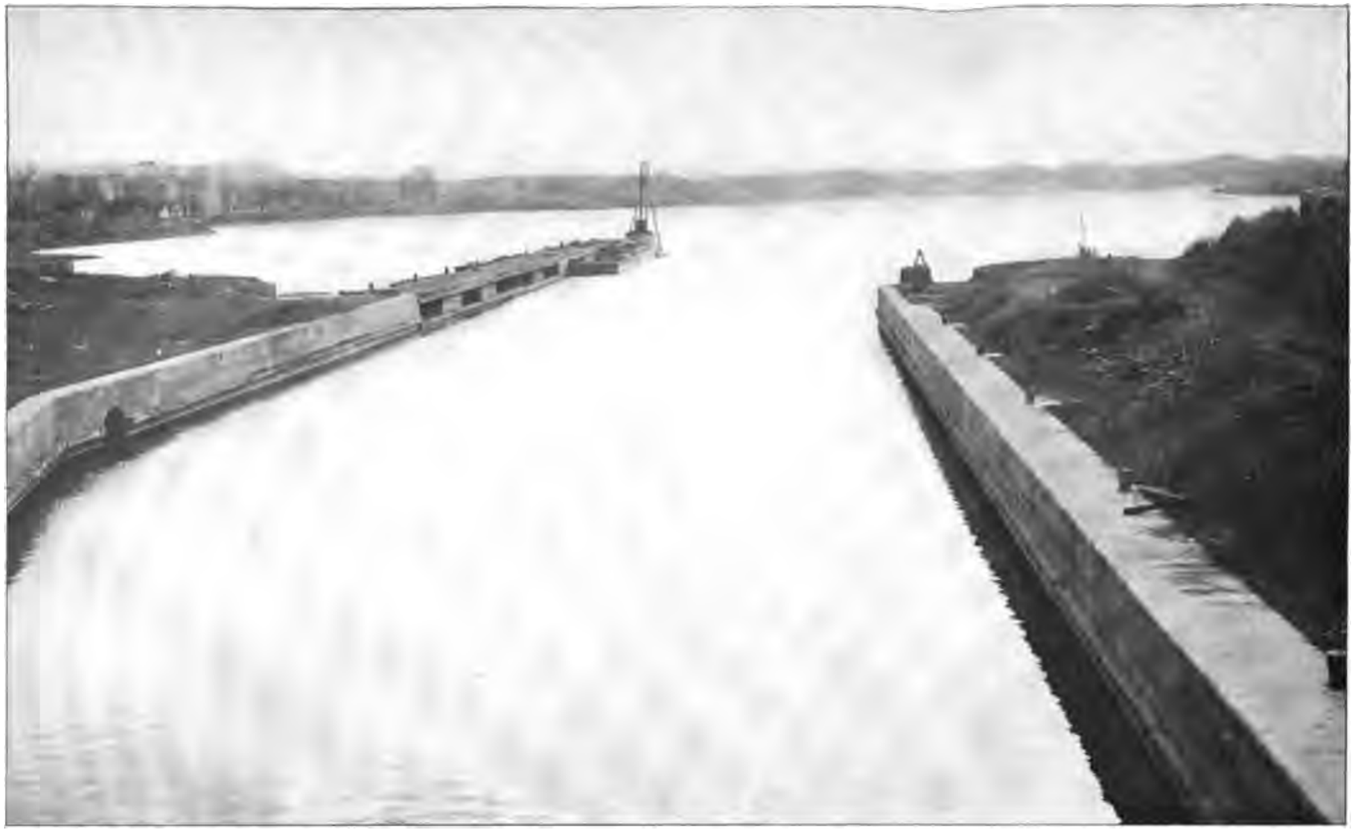
"*Riprap.* About 25 per cent of the first-class riprap has been placed for the protection of the west embankment above the Crocker's Reef dam.

"*Completed Work.* During the year the following items of work have been done:

Balance of slides have been excavated to the prism lines.

Bottom excavation completed to grade.

Slopes trimmed closely to line.



Barge Canal, Contract No. 3.
View from the highway bridge at the foot of lock No. 6, at Fort Miller, showing the entrance from the Hudson to the Fort Miller–Crocker's Reef land line.

Wash-wall notch practically completed.

Embankment. Embankments at lock No. 6 chamber and approach wall completed from borrow-pits. Prism embankments completed from excavation for wash-wall notch.

Concrete. The Fort Miller culvert extension, connecting the southeast approach wall with the Fort Miller culvert under the old Champlain canal, is completed; vertical wall along temporary canal at lock No. 13, completed; all work completed, except surfacing the lock walls and its approaches.

"*Summary.* The amount paid by the State on account of contract No. 3 is as follows:

Original contract and alterations, including the 10 per cent retained by State	$627,310 00
Work order of October 10, 1906	36,043 70
Work order of October 8, 1907	3,713 67
Work order of October 21, 1907	32 00
Work order of July 21, 1908	2,866 08
Work order of July 21, 1908	10,975 68
Work order of Sept. 21, 1908	160 00
Total	$681,101 13

" The following is a summary of the items on contract No. 3 as they stand on September 30, 1909, as modified by all alterations to date:

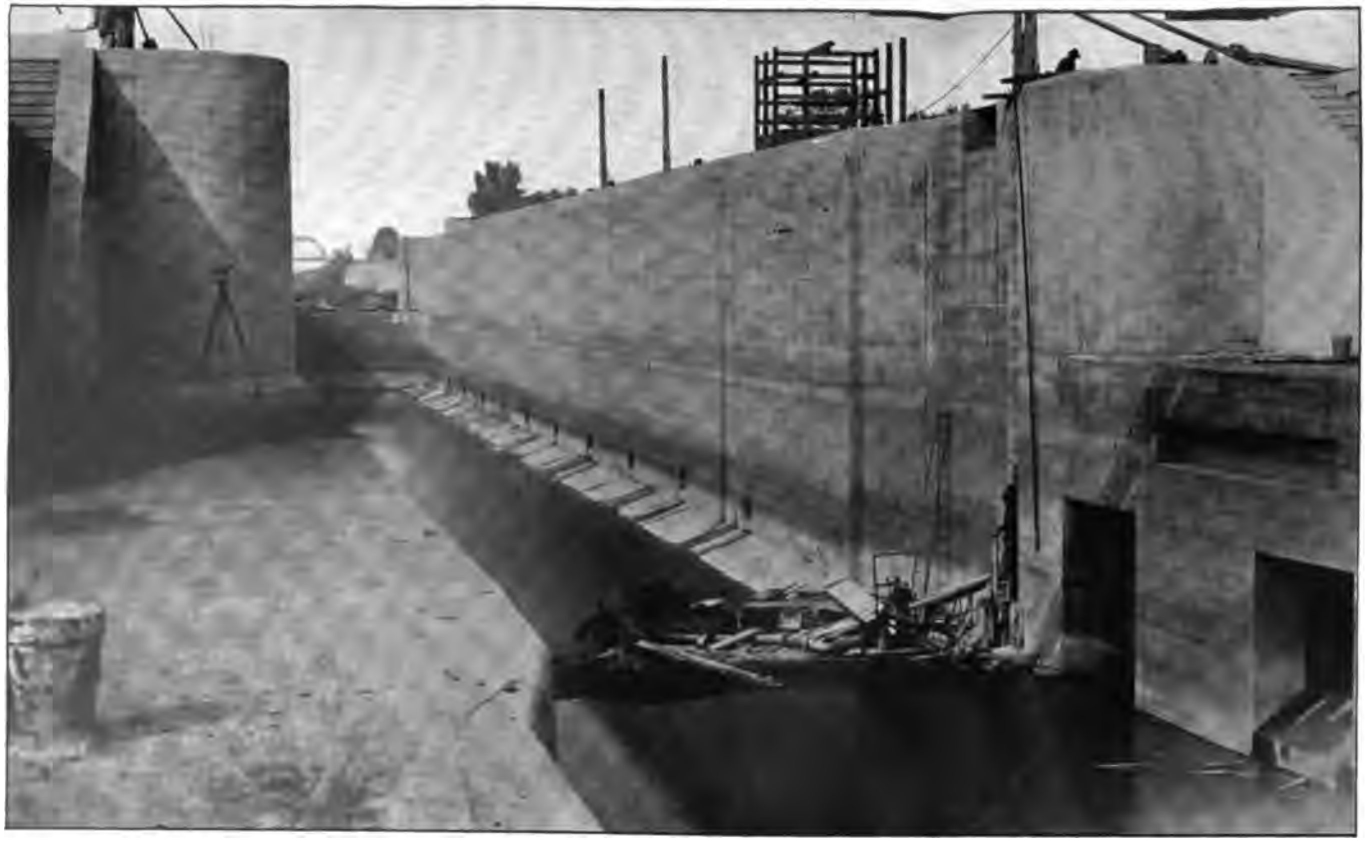
ITEMS OF WORK.	Preliminary estimate.	Quantities as modified by alterations 1 to 7.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing....................lump sum	1	1	0	1	0	100
Grubbing....................cu. yds.	6,350	8,389	0	6,984	0	83
All excavation................cu. yds.	667,823	837,231	54,001	801,153	6.7	96+
Forming embankment..........cu. yds.	76,292	115,503	13,618	109,637	12.4	95—
Lining........................cu. yds.	2,500	5,300	393	4,825	8.1	91+
Puddle........................cu. yds.	900	900	0	734	0	81.5
Yellow pine timber and plank.. ft. B. M.	25,000	50,000	22,750	44,352	51.2	88+
White oak timber in miter-sills..ft. B. M.	0	3,000	593	1,185	50	39.5
Hemlock timber and plank.....ft. B. M.	11,000	11,000	0	9,179	0	83.4
Foundation piles, 15 ft. long........No	8	8	0	8	0	100
Foundation piles, 20 ft. long........ No.	4	4	0	4	0	100
Foundation piles, 25 ft. long........No.	4	4	0	4	0	100
Second-class concrete..........cu. yds	1,574	36,711	342.5	33,944	1+	92+
Third-class concrete............cu. yds.	150	450	0	377	0	83.7
First-class masonry............cu. yds.	10	10	0	0	0	0
Wash-wall including coping.....cu. yds.	26,987	27,458	20,426	20,604	99+	75+
First-class riprap..............cu. yds.	187	1,600	231	231	100	14.4
Iron castings......................lbs.	6,517	136,867	5,366	129,015	4+	94.3
Steel castings.....................lbs.	0	5,000	0	1,477	0	29.5
Structural steel...................lbs.	1,911	65,403	1,045	28,951	3.6	44.2
Wooden fencing..................lin. ft.	3,600	4,800	365	3,309	11+	68.8
Removing and resetting old bridge superstructure.................lump sum	1	1	0	1	0	100
Sidewalk.........................lin. ft.	0	450	328	419	78+	93+
Iron castings, machined............lbs.	0	24,000	0	25,152	0	104.8
All excavation outside original lines ....cu. yds.	18,000	18,000	477	*21,027	22.6	116.8
All additional forms, etc., for concrete ....lump sum	0	1	0	$5,820	0	100
All additional forms for recesses for operating machinery and cap stans lump sum	0	1	0	$393.07	0	100

* More than a 15 per cent increase allowed by resolution of Canal Board, December 5, 1908.

" *Contract No. 3–A.*

" For the removal of certain dwellings, barns, stables, shops, outhouses and other structures, their foundations and other accesories, the cleaning out of all vaults and cesspools and disposal of their contents, building foundations, for moving house to parcel No. 148, for excavating cellar and for moving schoolhouse on parcel No. 141, on the site of contract No. 3. Contractors, Sundstrom & Stratton. Engineer in charge for the State, C. A. Curtis, Assistant Engineer.

" This contract has been completed with the exception of removing a part of the small icehouse which stands on the right of way appropriated from Sarah Thorpe. No change has been made in this contract during the fiscal year.



Barge Canal, Contract No. 3.
Lock No. 6, Champlain canal, at Fort Miller, about completed.

" *Contract No. 7.*

" For furnishing and erecting in place steel highway bridge superstructures as follows: On contract No. 3, Champlain canal, section 2, bridge at Fort Miller, Sta. 151 + 84.54; bridge at Ridge road, Sta. 173 + 18; Payne's bridge, Sta. 213 + 10. Contractor, Groton Bridge Company. Engineer in charge for the State, C. A. Curtis, Assistant Engineer.

" The work on this contract was given its final inspection in June, 1909, and was declared satisfactory with the exception of the painting of the bridges. A force of men was sent on by the company and the defective work was repaired. After this the final estimate of that portion of the contract done on contract No. 3 was rendered, the account standing as follows:

317,486 lbs. structural steel, per lb., $.04¾	$15,080 59
84 lin. ft. railings, per lin ft., $1.50	126 00
10,408 ft. B. M. yellow pine or Douglas fir sawed lumber, per M. ft. B. M., $45	468 36
6.1 cu. yds. setting stone cop'g, per cu. yd., $2	12 20
7 cu. yds. lining, per cu. yd., $2	14 00
Alteration No. 1 (approved by Canal Board, August 28, 1907).	
17,303 ft. B. M. yellow pine or Douglas fir sawed lumber, per M. ft. B. M., $41.50	718 07
Total	$16,419 22

" *Contract No. 16.*

" For furnishing and erecting in place steel highway bridge superstructures as follows: On contract No. 27, Champlain canal, section 2, Dunhams Basin bridge, Sta. 1048 + 70; East St. bridge, Sta. 1178 + 00; Argyle St. bridge, Sta. 1218 + 85; bridge below lock No. 7. Contractor, The United Construction Co. Engineer in charge for the State, S. W. Belding, Assistant Engineer.

" During the year the contractor has erected the bridge over the Barge canal at Dunhams Basin, on contract No. 27, and has completed it according to the specifications for the various items as shown in the table attached.

"The following is a summary of the items on contract No. 16, as they stand on September 30, 1909, as modified by alteration No. 1:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Structural steel........................lbs.	524,000	111,687	111,687	21.3	21.3
Sawed lumber, yellow pine or Douglas fir ....M. ft. B. M.	45	9 267	9 267	2.1	2.1
Sidewalk railings........................lin. ft.	406	0	0	....	....
Setting stone coping........................cu. yds.	8.2	2	2	24.8	24.8
Lining........................cu. yds	8	2	2	25	25

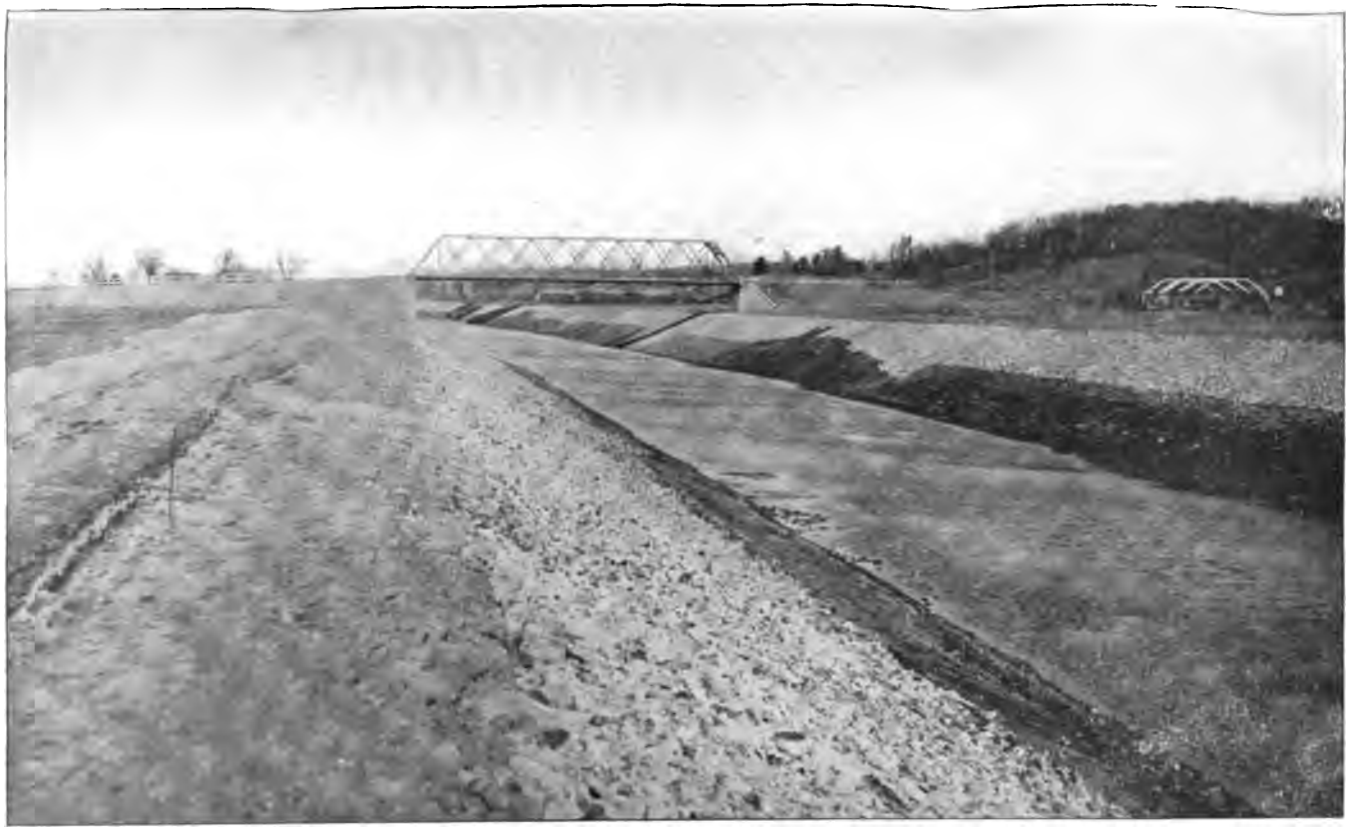
"*Contract No. 26.*

"For dredging a channel in the Hudson river between the south end of contract No. 27, Sta. 1245, at Fort Edward, and the north end of contract No. 1, Sta. 1286 + 33. Length 0.76 mile. Contractor, Lake Erie Dredging Co. Engineer in charge for the State, Harry Shoemaker, Assistant Engineer.

"*Excavation.* The dipper-dredge was employed in excavating the prism from October 1, 1908, to December 10, 1908, when it was laid up at the foot of Bradley's island for the winter, together with the scows and tug. Later in the winter the entire fleet underwent repairs and was again put in commission April 27, 1909.

"The excavated material has been placed in bottom-dump scows, which are hauled within the spoil area back of the timber crib on the west side of the river, then the material was rehandled by the dredge and a centrifugal pump. The pump was unable to handle the material on account of the large amount of sawmill edgings and debris during the season of 1909, and was abandoned. The construction of a traveling derrick, operating a Hayward clam, began May 7, 1909, and this commenced work July 10, since which time the scows are dumped in the spoil area and the material is rehandled by this clam, forming a spoil bank up to the prescribed elevation shown on the plans.

"On account of the changing of lock No. 7 from the site of contract No. 27 to the upper end of contract No. 26, an alteration was put in force June 5, 1909, which decreased the quantity of excavation 56,800 cubic yards.



Barge Canal, Contract No. 3.
View showing a portion of the completed canal prism, with a new bridge spanning the channel.

"During the winter of 1908–1909 a considerable amount of material silted on the site of this contract at the south end of the island.

"The following is a summary of the items on contract No. 26, as they stand on September 30, 1909, as modified by all alterations to date:

ITEMS OF WORK.		Preliminary estimate.	Quantities as modified by alteration.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing	lump sum	$25 00	$25 00	40%	40	40
All excavation	cu. yds.	172,000	115,200	61,800	44.5	53.

"*Contract No.* 27.

"For excavating the canal and protecting its sides, constructing locks No. 7, No. 8 and junction lock, necessary spillways, power plants and appertaining structures, a concrete arch bridge, bridge substructures and approaches, retaining walls, highways and other incidental details, between Sta. 1046 + 16, the south end of contract No. 25, at Dunhams Basin road, and the Hudson river at Fort Edward, Sta. 1245. Length of contract, 3.76 miles. Contractor, Kinser Construction Co. Engineer in charge for the State, S. W. Belding, Assistant Engineer.

"This report really covers the period between September 30, 1908, and January 1, 1909, for the reason that since the latter date practically no work has been done. This suspension of operations was caused by a disagreement between the State and the contractor over damages, etc., as a result of the slide of December 15, 1908, at the site of lock No. 7. Work has not been resumed as yet and the contractor has removed a large portion of his plant, leaving only his concrete-mixing plant, two dinky locomotives, with original track, five derricks (without hoisters), two hoisting engines, fifteen concrete buckets, and a few dump cars, small tools, etc.

"*Grubbing.* The grubbing done was made by the electric Page bucket excavators, as they moved forward for the excavation, and varied considerably in depth. Only nine inches have been allowed for the estimates.

"*Excavation.* The rough excavation for the prism is completed between the north end, at Sta. 1046 + 16, and Sta. 1137 + 00; also between Stations 1148 + 00 and 1223 + 00, excepting only a narrow strip for the highway crossing at East street.

"The excavation for the main walls of lock No. 8 and that for the northwest, northeast and southeast approach walls is also complete, as is that for the bridge abutments at Dunhams Basin and both the bridges at East street.

"At the original site for lock No. 7 the excavation was practically completed when the slide of December 15, 1908, occurred, and considerable material had been removed from the lower pool. Upon the refusal of the contractor to take steps to maintain navigation in time for the opening of the present Champlain canal — May 15, 1909 — at the site of the slide, which cut off the canal and tow-path, the Department of Public Works took the work in hand and built an earthen dike with puddle face for a tow-path from 200 feet below the Argyle street bridge to the Hudson Valley trolley bridge over the canal, thus forming a pool over the site of Barge canal lock No. 7. This arrangement to handle boats has operated successfully the past season.

"The cut for the new Bond creek channel is finished and so is the excavation for the junction lock and its northeast approach wall.

"The excavation remaining unfinished includes a short section at each end of lock No. 8, with that for the power plant; the rock in the lower pool, lock 8; the uncompleted prism between Stations 1223 + 00 and 1245 + 00, with the connection of the junction lock; that for the abutments at Argyle street, Baldwin avenue and the bridge at Sta. 1240 + 00; the wash-wall notch and the excavation for the dive culverts and ditches.

"*Sheeting and bracing.* The only sheeting and bracing used thus far was at the north end and southwest corner of the junction lock.

"*Embankment.* No embankment has been built as yet along the canal prism, but the following items have been done:

"Embankment around main walls and northeast approach wall, junction lock.

" Bridge approaches at Dunhams Basin, about 9/10 completed, those at East street about 4/5 finished, and the approaches to the new bridges between Argyle St. and Baldwin Ave. about ½ completed.

" *Sawed lumber, yellow pine.* The fenders on north approach walls at junction lock are complete.

" *White oak.* The miter-sills are set in lock No. 8 and the junction lock, as are also the mud sill, tumble gate sill and wall timbers at junction lock.

" *Foundation piles.* Round piles are driven under main and north splay walls — junction lock; also under bridge abutments — Dunhams Basin and both bridges at East street; under northeast splay wall, lock 8, and under northwest approach wall from north end south to Sta. 1137+05. Considerable difficulty was found in obtaining the required bearing for part of the last-named lot of piles; and also in holding them to their position when driving others nearby. This trouble had not yet been overcome at the time the work closed down in December, 1908.

" *Sheet-piling.* Sheet-piling has been driven under the entire length of the main walls of the junction lock and between the piers at the northwest corner of lock No. 8.

" *Wrought iron pipe railing.* Pipe railing is in place along both stairways at the south end of lock No. 8.

" *Second-class concrete.* The junction lock with its north splay walls and the northeast approach wall is complete, as are also the bridge abutments at Dunhams Basin. The northwest approach wall at lock No. 8 is complete for a length of about 220 feet, with 300 feet more at various elevations and incomplete; the main walls, floor, northeast splay wall, the isolated snubbing posts at north end of east side and about 60 feet of the southeast splay wall of lock No. 8 are complete, but the top surfacing at some points is not satisfactory and will have to be repaired.

" The footings for piers and back posts of the main bridge at East street are in place, and the east abutment of the Bond creek bridge at that location is nearly complete. About two feet in depth of the footing course for the west abutment at Bond creek is laid.

" *Reinforced concrete.* The only reinforced concrete in place is that in the standard abutments at Dunhams Basin bridge.

"*Metal reinforcement.* This includes the metal required in the junction lock and the main walls of lock No. 8, and is complete.

"*Masonry bridge coping.* About two cubic yards for the Dunhams Basin bridge was finished.

"*Structural steel.* As the gates are not yet placed in the junction lock the structural steel called for is about one-third in place, and that at lock No. 8 is practically complete as far as the walls are built.

"*Iron castings, plain and machined.* All iron castings called for in the walls of the junction lock, lock 8, and the splay and approach walls, as already built, are in place, but the iron for both gates at the junction lock and that for operating the tumble-gate has not been delivered.

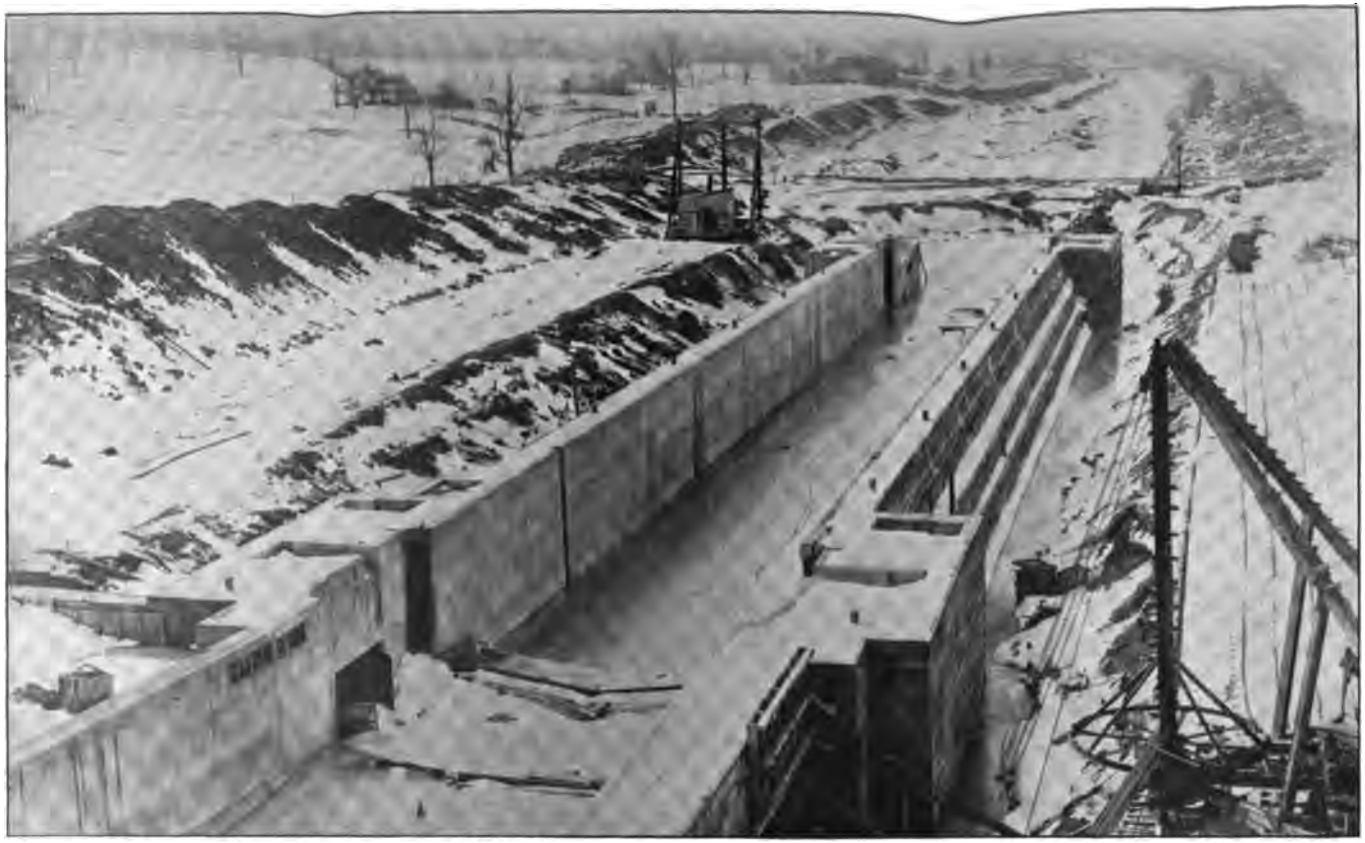
"The machined iron in the valve seats at lock No. 8 is in place.

"*Removing old bridge superstructures.* One of the old bridges on East street has been removed.

"*Maintaining traffic.* Traffic has been maintained at Dunhams Basin, East street, Broadway, Fort Edward, and at intervals in a very unsatisfactory manner at Baldwin avenue, due to flimsy construction of temporary bridge abutments.

"*Cast iron quoin-plates.* Quoin-plates are all in place at lock No. 8.

"*Maintaining traffic at Bond creek crossing.* Traffic has been maintained at the East street crossing.



Barge Canal, Contract No. 27.
Bird's-eye view of lock nearing completion; lock No. 8, Champlain canal, near Fort Edward.

" The following is a summary of the items on contract No. 27, as they stand on September 30, 1909, as modified by alterations 1 to 7:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	1	....	....	17	77.4
Grubbing........................cu. yds.	13,973	4,362	12,036	31 2	86.1
All excavation....................cu. yds.	1,345,193	294,292	908,151	21.8	67.5
Sheeting and bracing..........M. ft. B. M.	53	0	3.671	0	6.9
Forming embankment.............cu. yds.	195,423	26,485	36,514	13.5	18.6
Gravel lining......................cu. yds.	4,837	0	0	....	....
Sawed lumber, yellow pine or Douglas fir ....M. ft. B. M.	22.5	0	0.568	....	2.5
Sawed lumber, hemlock........M. ft. B. M.	0	0	0	....	....
Yellow pine in lock-gates......M. ft. B. M.	7	0	0	....	....
White oak....................M. ft. B. M.	3.12	2.966	2.966	95.1	95.1
Round timber.........................lin. ft.	0	0	0	....	....
Foundation piles, 12 ft. long...........No.	7	0	0	....	....
Foundation piles, 15 ft. long...........No.	1,277	324	324	25.3	25.3
Foundation piles, 16 ft. long...........No.	0	0	0	....	....
Foundation piles, 20 ft. long...........No.	1,296	35	95	2.7	7.3
Foundation piles, 24 ft. long...........No.	0	0	0	....	....
Sheet-piling..................M. ft. B. M.	143.232	1.834	77.614	1.2	5.4
Wrought iron pipe railing...........lin. ft.	56	35	35	62.5	62.5
Second-class concrete.............cu. yds.	33,417	5,930	18,772	17.7	56.2
Reinforced concrete...............cu. yds.	1,189	82	94	6.9	7.9
Metal reinforcement....................lbs.	72,067	9,910	12,523	13.7	17.4
Masonry bridge coping............cu. yds.	17	0	2	0	11.7
Wash-wall........................cu. yds.	24,546	0	0	....	....
Second-class stone paving.........sq. yds.	768	0	0	....	....
Third-class riprap................cu. yds.	132	0	0	....	....
Fourth-class riprap...............cu. yds.	0	0	0	....	....
Wooden fencing...................lin. ft.	6,100	0	0	....	....
Structural steel.......................lbs.	213,775	10,827	15,032	5.1	7
Iron castings..........................lbs.	73,310	9,622	37,195	13.1	50.7
Iron castings, machined...............lbs.	7,650	0	6,520	0	85.2
Sluice-gates, complete, with hoists, etc...No.	1	0	0	....	....
Lowering Argyle St. bridge superstructure ....lump sum	1	0	0	....	....
Removing old bridge superstructures....... ....lump sum	1	....	....	25	25
Maintaining traffic..............lump sum	1	....	....	15	15
Deduct for buildings............lump sum	1	0	0	....	....
Cast iron quoin-plates..................lbs.	8,700	7,909	9,050	90.9	104
Cast iron pipe.........................lbs.	216,394	0	0	....	....
Wooden pavement................sq. yds.	350	0	0	....	....
Lattice railing...................lin. ft.	152	0	0	....	....
15-in. vitrified pipe................lin. ft.	35	0	0	....	....
Maintaining traffic, Bond creek....lump sum	1	....	....	25	25
Extra or unspecified work orders.					
24-ft. foundation piles, junction lock.....No.	....	....	705	0	100
Repairing break, junction lock.force account	....	....	....	0	100
24-ft. foundation piles, junction lock.....No.	....	....	39	0	100
20-ft. foundation piles, northwest approach wall, lock 8.........................No.	....	....	542	100	100
Driving and holding down piles under part of northwest approach wall, lock No. 8 ....No. and force account.	....	....	12	....	Unfinished
Building earth dam across old canal, Fort Edward..................force account	....	....	....	100	100

"*Contract No.* 32.

" For constructing the lock-gates, needle-beams, needles and lock-valves on contracts Nos. 3, 25 and 27. Contractor, Penn Bridge Company. Engineer in charge for the State, C. A. Curtis, Assistant Engineer.

"A small force arrived the latter part of August and began assembling the plant for erecting the gates and needle-beams at lock No. 6, on contract No. 3. Timber for needles was received and the lower needles were shaped and treated with the preservative."

CHAMPLAIN CANAL, RESIDENCY NO. 3.

Assistant Engineer D. B. LaDu reports:

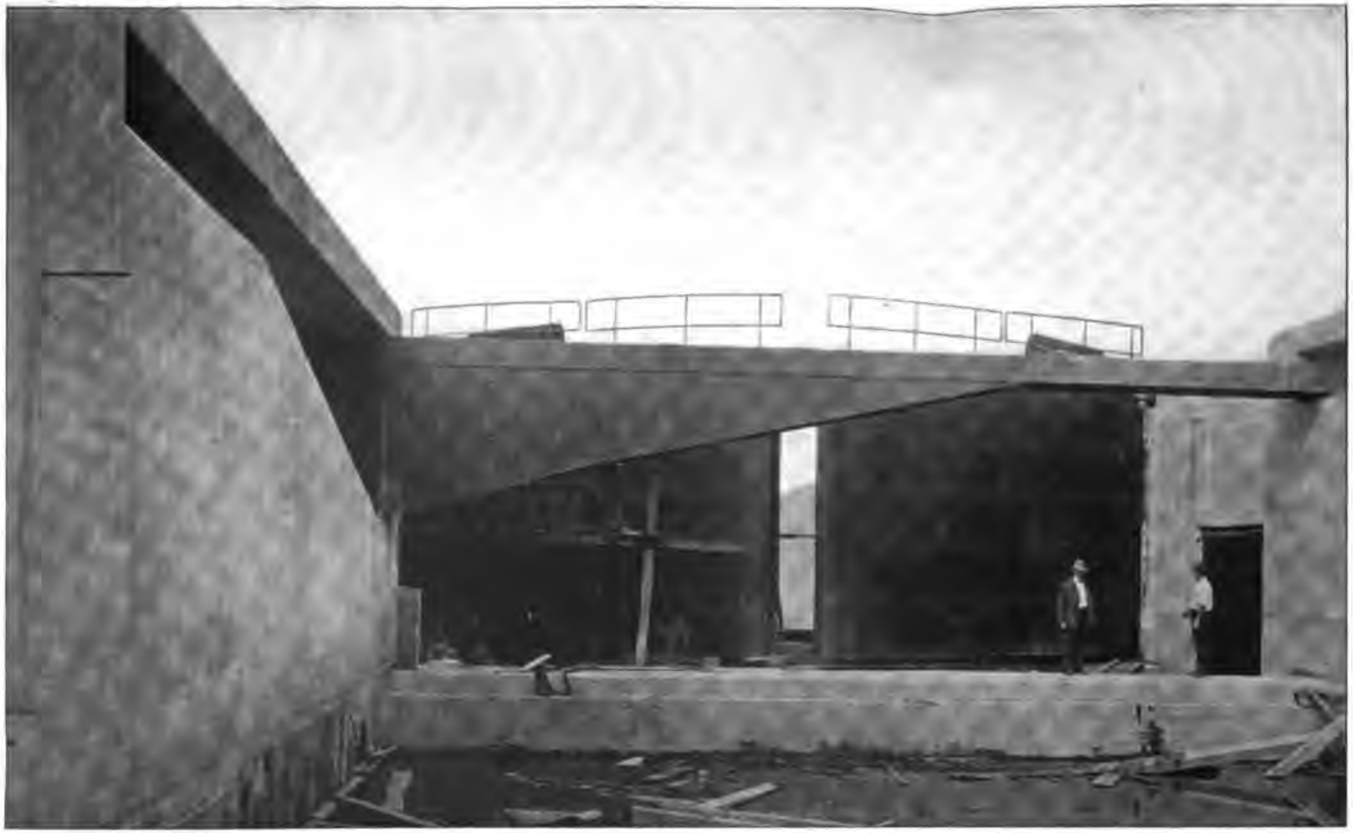
"This residency extends from the highway crossing at Dunhams Basin, Washington county, to Lake Champlain, at Whitehall, Washington county, a distance of 19.8 miles.

"*Contract No.* 15. For excavating the canal and protecting its sides, constructing lock No. 11, dam No. 4, lock No. 12, dam No. 5, and appertaining structures, a spillway, a highway, two masonry culverts, five bridges with their piers and abutments, and other incidental details, between Lake Champlain at Whitehall, Washington county, Sta. 0–73, and Sta. 356, on Wood creek, about 0.6 mile north of Comstock post-office, Washington county. This contract was awarded to the Atlantic, Gulf & Pacific Company on August 9, 1906. Its length is 6.8 miles, extending from Lake Champlain at Whitehall to a point about 0.6 mile north of Comstock.

"At Whitehall the construction of the east (river) wall of lock 12, including the timber crib at the north end, progressed until the latter part of January, when work was closed down for the winter. During April and May the remainder of this wall was completed. No construction work has been done on lock 12 during the summer months.

"Just south of Saunders street bridge, Whitehall, about 79 per cent of the southeast approach wall of lock 12 has been constructed. This is all that can feasibly be done on this wall at present.

"During the fall of 1908 the dyking machines and hydraulic dredge *Champlain* worked northward through the village of Whitehall to a point near the Saunders street bridge, completing all the available excavation, after which the dyking machines were re-



Barge Canal, Contract No. 15.
View of lock No. 11, at Comstock, showing upper gates and buffer-beam in place.

moved to contract No. 25 and the dredge *Champlain* to Comstock for winter repairs. In April the dredge began operation near lock No. 11 and worked northward to the guard-lock, cleaning up the canal bottom and flattening the slope on the west side. The dredge has also excavated for the upper and lower approaches to lock No. 11, and on the completion of the above work was transferred to contract No. 25.

" During the summer a floating excavator has been constructed near the guard-lock. This machine, working northward, began operations in September, trimming the prism slopes on the east side to conform to the lines for wash-wall.

"At lock No. 11 the construction of the lock walls and approaches and the erection and hanging of the needle-beams continued until January, when all work, except the building of a dipper-dredge, was suspended for the winter. Since the opening of work in the spring the concrete work for the lock proper has been almost completed; both the upper and lower gates have been erected and swung into position; the southwest approach wall is entirely finished, and the northwest and southeast approach walls have been, respectively, 32 per cent and 27 per cent completed.

"All construction work has progressed satisfactorily throughout the year.

" The Delaware and Hudson Railroad Company has constructed the bridge abutments for the Rutland Branch crossing over the Barge canal at Whitehall. Both of these abutments have been completed, and the company is now driving piles for the false work.

"The following is a summary for the year ended September 30, 1909:

ITEMS OF WORK.		Preliminary estimate, including alterations.	Work done during year	Total work done to date.	Per cent of work done during year.	Per [illegible]
Clearing	acres	12.36	0	12.36	0	[illegible]
Grubbing	cu. yds	12,000	932	7,957	8	[illegible]
All excavation	cu. yds	2,915,110	383,648	2,272,277	13	[illegible]
Sheeting and bracing	ft B M	50,000	6,299	17,375	13	[illegible]
Embankment	cu. yds	167,500	392	2,128	0.2	[illegible]
Sawed lumber, hemlock	ft B M	40,000	20,061	20,061	50	[illegible]
Sawed lumber, yellow pine	ft B M	95,000	19,208	19,208	20	[illegible]
White oak in mitre sills	ft B M	4,450	1,958	1,958	44	[illegible]
Stone filling in cribs	cu. yds	850	567	567	67	[illegible]
Piling	No	8,492	1,988	5,004	23	[illegible]
Sheet piling	ft B M	100,740	12,483	87,412	12	[illegible]
All classes concrete	cu. yds	56,481	15,498	36,634	27	[illegible]
4 inch vitrified pipe	lin. ft	300	30	268	10	[illegible]
Iron castings, plain	lbs	160,000	22,641	123,455	14	[illegible]
Iron castings, machined	lbs	50,000	11,880	42,661	24	[illegible]
Structural steel	lbs	1,102,900	14,010	26,195	1	[illegible]
Metal reinforcement	lbs	127,480	5,550	15,675	4	12
Upper lock gates	lump sum	$11,100	$5,550	$5,550	50	50
Lower gates, lock No. 11	lump sum	$8,500	$8,500	$8,500	100	100
Needle dams, lock No. 11	lump sum	$5,200	$3,068	$3,068	59	59
Needle dams, upper end, lock No. 12	lump sum	$2,400		$240		10
Needle dams, lower end, lock No. 12	lump sum	$3,100	$310	$310	10	10
Lock valves	lump sum	$7,200	$5,400	$5,400	75	75
Gross estimate		$1,465,161	$238,580	$928,920	16.3	63.5

"*Contract No. 25.* For excavating the canal and protecting its sides, constructing lock No. 9 and necessary spillways, power plants and appertaining structures, bridge superstructures and approaches, retaining walls, highways and other incidental details, between Sta. 356, about 0.6 mile north of Comstock post-office, Washington county, and Sta. 1041 + 54, which is also Sta. 1010 + 10 at Dunhams Basin road, Washington county. The length of this contract is 13 miles. This contract was awarded to the Atlantic, Gulf & Pacific Company on November 19, 1906.

"The dredge *Fort Edward* worked until December, 1908, excavating to within four feet of grade up to Lock No. 9, just south of Smith's Basin. It also excavated about 1,000 feet north of Fort Ann. It began again in April and excavated about one mile north of Fort Ann and bottomed out to grade all but about one-half mile between Brayton's crossing and Smith's Basin. This dredge has been idle since July.

"The dredge *Ch*[illegible] started excavating in April at about 500 feet from the north end of the contract and excavated south to Dewey's bridge. This dredge has been idle since August.

"Excavation was made by hand for the Comstock retaining wall and culvert. Excavation was made by the towers and McMyler, l dykes erected from the north end of the contract to Flat Rock l from lock No. 9 to within one-half mile of the south end of contract. Also part of by-pass was excavated. Rock excation was also made for lock No. 9 and the upper approach wall.

" The rock cuts at Wooden Lock were nearly completed and about e-fifth of the rock at Flat Rock was removed.

"A number of ditches near lock No. 9 were completed. Emnkment was placed from Fort Ann about one mile north and also ack of Wood creek spillway, East creek spillway, and the siphon pillway.

" The highway about one mile north of Fort Ann, 2,200 feet long, was completed.

" Piles were under about one-half the southwest approach wall to lock No. 9, under the siphon spillway and under the Comstock retaining wall.

" Sheet-piles were driven in revetment from George Henry's road to within one mile of lock No. 9.

" The retaining wall and culvert at Comstock were constructed. The siphon spillway, the Wood creek spillway and East creek spillway were competed and lock No. 9 about five-eighths completed.

" Riprap on East creek spillway, Wood creek spillway, siphon spillway and by-pass was all laid.

" The following. is a summary for the year ended September 30, 1909:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing .... acres	65.69	24.19	65.69	37	100
Grubbing .... cu. yds.	36,600	4,824	9,435	13	26
All excavation .... cu. yds	5,595,270	1,663,647	3,404,930	30	61
Embankment .... cu. yds.	162,800	1,616	9,623	1	6
Lining .... cu. yds	13,900	1,499	1,499	11	11
Sawed lumber, hemlock .... ft. B. M.	2,700	2,570	2,570	95	95
Piling .... No.	1,970	789	963	37	*46
Sheet-piling .... ft. B. M.	1,249,000	332,072	340,886	27	28
Concrete, all classes .... cu. yds.	29,190	13,254	13,721	45	47
Riprap .... cu. yds.	3,630	1,420	1,455	39	40
Paving, second-class .... sq. yds.	1,100	15	15	1	1
Ballast .... cu. yds.	338	57	85	17	25
Iron castings, plain .... lbs.	27,890	15,145	15,145	55	55
Iron castings, machined .... lbs.	20,000	8,240	8,240	41	41
Metal reinforcement .... lbs.	87,920	10,317	13,649	12	16
Structural steel .... lbs.	56,180	5,738	5,738	10	10
Gross estimate	$1,686,345	$482,670	$890,240	29	53

* Due to extra work order.

IMPROVEMENT OF PUBLIC HIGHWAYS.

Although the work of highway improvement is not now in charge of this Department, it was not turned over to the newly-created Department of Highways till February 17, 1909, or four and a half months after the beginning of the fiscal year covered by this report. To complete the record of this form of public improvement while in charge of the State Engineer, an account of what was accomplished on the Eastern Division during this period of four and one-half months will be found in tabular form appended to my report.

APPENDED TABLES.

There will be found also a statement showing the engineering expenses and tables giving all contracts in force during the year, separated into two groups, those completed and those still pending.

Respectfully submitted,

GEORGE D. WILLIAMS,

Division Engineer.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE EASTERN DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED SEPTEMBER 30, 1909.

Ordinary Repairs to Canals — Erie Canal.

Chapter 465, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
L. B. Harrison	Division engineer	$3,600 per year	$900 00	....	$900 00
George D. Williams	Division engineer	3,600 per year	2,400 00	....	2,400 00
Noble E. Whitford	Resident engineer	2,700 per year	225 00	....	225 00
Charles Stark	Financial clerk	5 00 per day	135 00	....	135 00
Loretta C. Cantwell	Stenographer	50 per month	25 81	....	25 81
Hattie A. Dell	Stenographer	83 33 per month	166 66	....	166 66
B. L. Fredendall	Stenographer	150 per month	150 00	....	150 00
Geo. L. Schillner	Engineering draftsman	5 00 per day	1,035 00	....	1,035 00
H. J. Richardson	Rodman	4 00 per day	60 00	....	60 00
W. P. Deevey	Laborer	2 00 per day	62 00	....	62 00
			$5,159 47	....	$5,159 47
Incidental Expenses.					
Stationery and printing				$567 52	
Fuel and light				202 80	
Postage				140 00	
Telephone and telegraph				682 92	
Miscellaneous				1,259 67	
					2,852 91
Total					$8,012 38

Ordinary Repairs to Canals — Champlain Canal.

Chapter 465, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
George D. Williams	Division engineer	$3,600 per year	$300 00	....	$300 00
Noble E. Whitford	Resident engineer	2,700 per year	625 00	....	625 00
Charles B. Dunham, Jr.	Clerk	100 per month	100 00	....	100 00
B. L. Fredendall	Stenographer	150 per month	60 00	....	60 00
Hattie A. Dell	Stenographer	83 33 per month	499 98	....	499 98
Loretta C. Cantwell	Stenographer	50 per month	50 00	....	50 00
George L. Schillner	Engineering draftsman	5 00 per day	400 00	....	400 00
H. J. Richardson	Rodman	4 00 per day	232 00	....	232 00
			$2,266 98	....	$2,266 98
Incidental Expenses.					
Stationery and printing				$125 42	
Fuel and light				478 60	
Postage				100 70	
Telephone and telegraph				329 08	
Miscellaneous				686 84	
					1,720 64
Total					$3,987 62

Construction of Barge Canal — Head Office Account.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
W. R. Hill	Special deputy state engineer	$5,000 per year	$1,250 00	$487 54	$1,737 60
W. B. Landreth	Special deputy state engineer	5,000 per year	4,874 94	342 43	5,217 37
H. D. Alexander	Resident engineer	3,000 per year	3,000 00	389 80	3,389 80
George F. Chism	Resident engineer	2,700 per year	1,169 35	300 55	1,469 90
Robert E. Horton	Resident engineer	2,700 per year	2,500 64	2,164 51	4,665 15
S. M. Savage	Resident engineer	2,700 per year	1,800 00	52 84	1,852 84
Noble E. Whitford	Resident engineer	2,700 per year	1,800 00	40 72	1,840 72
O. F. Bellows	Resident engineer	2,400 per year	1,200 00	29 67	1,229 67
R. S. Greenman	Resident engineer	2,400 per year	2,400 00	2,178 39	4,578 39
C. H. Hoyt	Resident engineer	2,400 per year	735 48		735 48
E. A. Lamb	Resident engineer	2,400 per year	1,078 57		1,078 57
C. H. MacCulloch	Resident engineer	2,400 per year	1,290 32		1,290 32
H. P. Willis	Resident engineer	2,400 per year	289 17	80 20	369 37
W. R. Davis	Chief bridge designer	3,900 per year	3,395 76	17 91	3,413 67
John G. Peck	Assistant chief bridge designer	3,000 per year	2,951 35	702 41	3,653 76
John Bartholomew	Bridge designer	175 per month	792 48	18 06	810 54
R. C. Bastress	Bridge designer	175 per month	1,712 36		1,712 36
E. A. Brainard	Bridge designer	175 per month	2,100 00		2,100 00
G. M. Braune	Bridge designer	175 per month	2,010 38		2,010 38
J. C. Green	Bridge designer	175 per month	2,100 00		2,100 00
C. N. Haggart	Bridge designer	175 per month	1,855 56	4 20	1,859 76
A H. Higley	Bridge designer	175 per month	2,083 06	21 22	2,104 28
Harold Levy	Bridge designer	175 per month	2,042 60		2,042 60
H. D. Miller	Bridge designer	175 per month	1,862 90		1,862 90
H. J. Scheurermann	Bridge designer	175 per month	2,100 00	15 03	2,115 03
A. G. Hayden	Bridge designer	160 per month	1,339 32		1,339 32
Emil Bie	Bridge designer	150 per month	1,500 00		1,500 00
H. E. Brainerd	Bridge designer	150 per month	1,155 36	8 80	1,164 16
G. M. Purver	Bridge designer	150 per month	847 26		847 26
C. H. Wood	Bridge designer	150 per month	1,600 00		1,600 00
J. C. Podmore	Bridge designer	140 per month	1,562 61	9 15	1,571 76
J. H. B. Altdoerffer	Bridge designer	125 per month	808 61		808 61
G. H. Bugenhagen	Bridge designer	125 per month	820 83		820 83
J. P. Considine	Bridge designer	125 per month	771 23		771 23
H. E. Helfand	Bridge designer	125 per month	1,201 61		1,201 61
F. A. Hermans	Bridge designer	125 per month	1,500 00		1,500 00
A. E. Hill	Bridge designer	125 per month	166 67		166 67
F. W. Leonhard	Bridge designer	125 per month	875 00		875 00
E. L. Pierce	Bridge designer	125 per month	1,072 58		1,072 58
E. G. Semon	Bridge designer	125 per month	1,047 20	2 53	1,049 73
G. E. Maynard	Bridge draftsman	125 per month	1,175 15	26 96	1,202 11
F. B. Martin	Bridge draftsman	125 per month	725 00		725 00
W. P. Falkenstein	Bridge draftsman	110 per month	1,001 00		1,001 00
R. M. Wheeler	Bridge draftsman	110 per month	498 67		498 67
J. M. Angus	Bridge draftsman	100 per month	1,070 00		1,070 00
Leo Freitag	Bridge draftsman	100 per month	1,047 20		1,047 20
A. C. Miller	Bridge draftsman	100 per month	269 88		269 88
E. E. Briggs	Junior bridge draftsman	100 per month	1,193 55		1,193 55
S. T. Vosburgh	Junior bridge draftsman	90 per month	960 00		960 00
F. M. Beer	Junior bridge draftsman	75 per month	312 50		312 50
J. F. Blaise	Junior bridge draftsman	75 per month	112 26		112 26
W. H. Hale	Junior bridge draftsman	75 per month	38 71		38 71
C. E. Quimby	Junior bridge draftsman	75 per month	173 71		173 71
F. E. Winter	Provisional junior bridge draftsman	75 per month	14 52		14 52
C. C. Egbert	Expert on electrical design	20 00 per day	1,746 21	41 77	1,787 98
Geo. F. Stickney	Lock designer	375 per month	4,400 00	161 83	4,561 83
E. F. Van Hoesen	Expert on R. R. crossings	375 per month	3,084 68	164 89	3,249 57
D. A. Watt	Expert designer	375 per month	4,400 00	580 04	4,980 04
R. R. Stuart	Engineer water-supply	225 per month	1,350 00	131 79	1,481 79
J. T. Durham	Confidential assistant	4,000 per year	1,569 88	43 35	1,613 23
H. E. Breed	Financial clerk and auditor	2,800 per year	2,099 97	382 52	2,482 49
Parkes D. Wendell	Estimate clerk	175 per month	175 00	23 91	198 91
J. M. Smelzer	Index clerk	125 per month	1,125 00		1,125 00
Chas. B. Dunham, Jr.	Clerk	100 per month	664 52		664 52
John T. Gorman	Clerk	100 per month	1,150 00		1,150 00
J. C. Gaffin	Clerk	100 per month	1,200 00		1,200 00
Geo. W. Ruso	Clerk	100 per month	1,200 00		1,200 00
G. T. Waterman	Clerk	80 per month	720 00		720 00
J. E. F. Minnock	Clerk	75 per month	735 00		735 00
B. L. Fredendall	Stenographer	150 per month	300 00		300 00
H. W. Cowlbeck	Stenographer	125 per month	375 00		375 00
Nelle Clark	Stenographer	100 per month	1,200 00		1,200 00
Cleora Van Vleck	Stenographer	100 per month	1,099 98		1,099 98

Construction of Barge Canal — Head Office Account — (Cont'd).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Mabel Wienholz	Stenographer	$100 per month	$900 00		$900 00
H. L. Davis	Stenographer	83 33 per month	291 66		291 66
Hattie A. Dell	Stenographer	83 33 per month	83 33		83 33
Adele Hallenbeck	Stenographer	76 per month	912 00		912 00
S. C. MacNeill	Stenographer	75 per month	795 00		795 00
L. J. Mulhauser	Stenographer	75 per month	525 00		525 00
M. G. Harrington	Stenographer	60 per month	191 29		191 29
Grace Haswell	Stenographer	60 per month	700 00		700 00
J. J. Tobin	Stenographer	60 per month	660 00		660 00
B. T. Kelly	Stenographer	50 per month	9 68		9 68
Kathryn M. Pitts	Stenographer	50 per month	11 29		11 29
Martinie Devlin	Temporary stenographer	75 per month	36 29		36 29
Mary E. Heeran	Temporary stenographer	75 per month	55 65		55 65
C. D. Burrus	Engineering draftsman	6 00 per day	1,122 00		1,122 00
E. G. Blessing	Engineering draftsman	5 00 per day	1,550 00		1,550 00
E. A. Bonney	Engineering draftsman	5 00 per day	1,130 00	$16 33	1,146 33
J. M. Friedland	Engineering draftsman	5 00 per day	955 00		955 00
J. A. O'Donnell	Engineering draftsman	5 00 per day	1,515 00		1,515 00
Wm. J. Picard	Engineering draftsman	5 00 per day	1,544 00		1,544 00
Rupert Sturtevant	Engineering draftsman	5 00 per day	1,392 00		1,392 00
L. B. Westfall	Engineering draftsman	5 00 per day	1,560 00		1,560 00
T. S. Bailey	Engineering draftsman	4 50 per day	597 00	6 58	603 58
G. Gale Dixon	Engineering draftsman	4 50 per day	1,125 00	10 66	1,135 66
J. H. McCormick, Jr	Engineering draftsman	4 50 per day	1,378 50		1,378 50
E. E. Brandow	Engineering draftsman	4 00 per day	860 00		860 00
E. C. Hackett	Engineering draftsman	4 00 per day	1,124 00	1 95	1,125 95
L. Lee Hadley	Engineering draftsman	4 00 per day	1,252 00		1,252 00
G. D. Meer	Engineering draftsman	4 00 per day	1,248 00		1,248 00
A. P. Mussi	Engineering draftsman	4 00 per day	1,252 00		1,252 00
J. N. Stevens	Engineering draftsman	4 00 per day	836 00		836 00
J. L. Southworth	Engineering draftsman	4 00 per day	1,164 00		1,164 00
A. W. Thayer	Engineering draftsman	4 00 per day	1,330 50		1,330 50
J. J. Cosgrave	Architectural draftsman	125 per month	1,500 00		1,500 00
R. R. Shearer	Architectural draftsman	125 per month	1,312 50		1,312 50
F. E. Blake	Mechanical engineer	175 per month	1,859 70	2 00	1,861 70
W. S. Kloe	Mechanical draftsman	90 per month	907 50		907 50
C. P. Wiweke	Mechanical draftsman	90 per month	829 76		829 76
J. A. Jensen	Mechanical draftsman	75 per month	943 55		943 55
Theron Ainsworth	Tracer	75 per month	900 00		900 00
Bernard Gasler	Tracer	75 per month	750 00	2 70	752 70
G. L. Knott	Tracer	75 per month	865 51		865 51
Maximilian Komow	Tracer	75 per month	738 33		738 33
C. G. Lamphere	Tracer	75 per month	525 00		525 00
J. A. Pritchard	Tracer	75 per month	900 00		900 00
J. H. Forth	Tracer	60 per month	660 00		660 00
C. T. Kniskern, Jr	Tracer	60 per month	660 00		660 00
P. R. Murray	Tracer	60 per month	640 00		640 00
Edward Anderberg	Assistant engineer	6 00 per day	300 00		300 00
F. C Ashley	Assistant engineer	6 00 per day	1,734 00		1,734 00
F. A. Biggi	Assistant engineer	6 00 per day	510 00		510 00
Clark Brown	Assistant engineer	6 00 per day	1,866 00		1,866 00
S. F. Carlisle	Assistant engineer	6 00 per day	1,412 00		1,412 00
A. G. Chapman	Assistant engineer	6 00 per day	708 00	199 77	907 77
C. R. Chase	Assistant engineer	6 00 per day	1,890 00	69 23	1,959 23
J. S. Clancy	Assistant engineer	6 00 per day	1,212 00		1,212 00
W. S. Coulter	Assistant engineer	6 00 per day	1,974 00	7 46	1,981 46
DeWitt H. Daley	Assistant engineer	6 00 per day	1,602 00		1,602 00
E. J. Doyle	Assistant engineer	6 00 per day	1,770 00		1,770 00
F. M. Eames	Assistant engineer	6 00 per day	1,866 00		1,866 00
G. E. Gibson	Assistant engineer	6 00 per day	1,872 00		1,872 00
H. W. Hale	Assistant engineer	6 00 per day	1,773 00		1,773 00
R. L. Holt	Assistant engineer	6 00 per day	1,719 00		1,719 00
Charles Kiehm	Assistant engineer	6 00 per day	1,842 00		1,842 00
H. C. Kline	Assistant engineer	6 00 per day	330 00	7 54	337 54
D. R. Lee	Assistant engineer	6 00 per day	150 00	51 07	201 07
B. J. Lowenstein	Assistant engineer	6 00 per day	1,390 50	1 10	1,391 60
J. H. McElroy	Assistant engineer	6 00 per day	2,190 00	179 32	2,369 32
A. S. Mirick	Assistant engineer	6 00 per day	1,560 00		1,560 00
C. W. Morris, Jr	Assistant engineer	6 00 per day	1,753 00		1,753 00
J. P. Newton	Assistant engineer	6 00 per day	1,788 00		1,788 00
P. W. O'Grady	Assistant engineer	6 00 per day	792 00	14 40	806 40
E. C. Olcott	Assistant engineer	6 00 per day	1,851 00		1,851 00
R. E. Phillips	Assistant engineer	6 00 per day	1,884 00		1,884 00
E. G. Raynor	Assistant engineer	6 00 per day	1,188 00		1,188 00
B. W. Rosekrans	Assistant engineer	6 00 per day	1,836 00		1,836 00

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Construction of Barge Canal — Head Office Account — (Cont'd).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
A. D. Sanderson	Assistant engineer	$6 00 per day	$1,878 00	$177 43	$2,055 43
H. O. Schermerhorn	Assistant engineer	6 00 per day	1,962 00	13 87	1,975 87
W. H. Slingerland, Jr.	Assistant engineer	6 00 per day	1,860 00	11 19	1,871 19
A. E. Steere	Assistant engineer	6 00 per day	168 00		168 00
G. G. Underhill	Assistant engineer	6 00 per day	414 00		414 00
J. H. Sturdevant	Assistant engineer	6 00 per day	756 00		756 00
E. W. Sylvester	Assistant engineer	6 00 per day	1,098 00		1,098 00
T. R. Tetley, Jr.	Assistant engineer	6 00 per day	402 00		402 00
H. A. Weeks	Assistant engineer	6 00 per day	1,854 00	10 15	1,864 15
W. G. Wildes	Assistant engineer	6 00 per day	162 00	13 49	175 49
Joseph H. Young	Assistant engineer	6 00 per day	240 00	5 69	245 69
R. G. Finch	Assistant engineer	5 50 per day	1,634 00	8 01	1,642 01
H. A. Gehring	Assistant engineer	5 50 per day	1,633 50		1,633 50
F. S. Crowell	Assistant engineer	5 00 per day	1,360 00		1,360 00
B. I. Hall	Assistant engineer	5 00 per day	55 00	1 68	56 68
L. W. Irish	Assistant engineer	5 00 per day	330 00		330 00
F. C. Koerner	Assistant engineer	5 00 per day	1,570 00		1,570 00
G. W. Stickney	Assistant engineer	5 00 per day	60 00		60 00
H. T. Arnold	Leveler	5 00 per day	1,357 00		1,357 00
A. T. Clark	Leveler	5 00 per day	1,546 50		1,546 50
J. F. Greathead	Leveler	5 00 per day	832 00		832 00
T. A. Hendrickson	Leveler	5 00 per day	660 00		660 00
George G. Sweet	Leveler	5 00 per day	1,555 00		1,555 00
T. L. Watkins	Leveler	5 00 per day	1,570 00		1,570 00
D. W. Overocker	Leveler	4 50 per day	648 00		648 00
L. S. Rickard	Leveler	4 50 per day	738 00		738 00
J. B. Whipple	Leveler	4 50 per day	535 50		535 50
C. M. Colony	Rodman	4 00 per day	372 00		372 00
A. R. Patchke	Rodman	4 00 per day	1,038 00		1,038 00
Frank Roberts	Rodman	4 00 per day	1,076 00		1,076 00
M. E. Cottrell	Rodman	3 50 per day	276 50		276 50
R. E. Demming	Rodman	3 50 per day	126 00		126 00
G. B. Kelley	Rodman	3 50 per day	1,106 00		1,106 00
D. H. Hill	Rodman	3 50 per day	108 50		108 50
J. J. Schworm	Rodman	3 50 per day	38 50	4 33	42 83
J. C. Adams	Chainman	2 50 per day	468 00		468 00
M. H. Boigeol	Chainman	2 50 per day	468 00		468 00
H. V. Button	Chainman	2 50 per day	420 00		420 00
W. H. Dodd	Chainman	3 00 per day	930 00		930 00
H. F. Eagan	Chainman	3 00 per day	327 00		327 00
M. I. Franklin	Chainman	3 00 per day	15 00		15 00
Jacob Gallowitz	Chainman	3 00 per day	20 00		20 00
Joseph T. Murphy	Chainman	3 00 per day	920 00		920 00
E. C. Niles	Chainman	3 00 per day	918 00		918 00
N. B. Robbins	Chainman	3 00 per day	85 00		85 00
E. V. Allendorph	Inspector of masonry	5 00 per day	1,130 00	36 46	1,166 46
M. S. Bierce	Inspector of masonry	5 00 per day	1,549 00	102 61	1,651 61
Charles M. Leet	Inspector of masonry	4 50 per day	491 00	56 73	547 73
J. M. Taylor	Inspector of masonry	4 50 per day	295 50		295 50
E. F. Weeks	Inspector of masonry	3 50 per day	297 50		297 50
D. F. Allen	Laborer	2 00 per day	204 00		204 00
William Atkinson	Laborer	2 00 per day	472 00		472 00
Clarence Barker	Laborer	2 00 per day	4 00		4 00
A. M. Barton	Laborer	2 00 per day	360 00		360 00
F. C. Batt	Laborer	2 00 per day	32 00		32 00
J. H. Boyland	Laborer	2 00 per day	648 00		648 00
J. J. Brown	Laborer	2 00 per day	38 00		38 00
J. H. Byrnes	Laborer	2 00 per day	70 00		70 00
J. M. Connolly	Laborer	2 00 per day	174 00		174 00
G. E. Cumner	Laborer	2 00 per day	378 00		378 00
George Cunningham	Laborer	2 00 per day	326 00		326 00
J. E. Dempsey	Laborer	2 00 per day	174 00		174 00
R. J. Dobbins	Laborer	2 00 per day	136 00		136 00
Stephen Feenan	Laborer	2 00 per day	182 00		182 00
Alexander Greenwald	Laborer	2 00 per day	524 00		524 00
James Haley	Laborer	2 00 per day	452 00		452 00
W. A. Hanrahan	Laborer	2 00 per day	166 00		166 00
Harry Hertz	Laborer	2 00 per day	218 00		218 00
Edgar Hull	Laborer	2 00 per day	416 00		416 00
George E. Koonman	Laborer	2 00 per day	368 00		308 00
Simeon Lodewick	Laborer	2 00 per day	598 00		598 00
J. M. Macdonald	Laborer	2 00 per day	442 00	1 48	443 48
M. A. McMahon	Laborer	2 00 per day	128 00		128 00
L. E. Moore	Laborer	2 00 per day	198 00		198 00
Carroll A. Parry	Laborer	2 00 per day	344 00		344 00

Construction of Barge Canal — Head Office Account — (Concl'd).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. S. Parsons	Laborer	$2 00 per day	$216 00		$216 00
James L. Quinn	Laborer	2 00 per day	176 00		176 00
Thomas Rattoone	Laborer	2 00 per day	510 00		510 00
C. H. Richardson	Laborer	2 00 per day	44 00		44 00
H. J. Soules	Laborer	2 00 per day	78 00		78 00
Julius Stern	Laborer	2 00 per day	194 00		194 00
Michael Tierney	Laborer	2 00 per day	714 00		614 00
H. J. Whitman	Laborer	2 00 per day	136 00		136 00
F. M. Hill	Title maker	100 per month	1,200 00		1,200 00
E. M. Chamberlain	Night watchman	80 per month	960 00		960 00
E. H. Wetsel	Foreman of public works	5 00 per day	1,535 00		1,535 00
John J. McManus	Foreman of borings	4 50 per day	153 00		153 00
Ammie Bailey	Axeman and office assistant	2 00 per day	116 00		116 00
M. E. Baker	Axeman and office assistant	2 00 per day	636 00		636 00
LeRoy Bamer	Axeman and office assistant	2 00 per day	620 00		620 00
K. M. Boutelle	Axeman and office assistant	2 00 per day	620 00		620 00
Thomas E. Bowen	Axeman and office assistant	2 00 per day	730 00		730 00
J. S. Burns	Axeman and office assistant	2 00 per day	628 00		628 00
J. G. Bushnell	Axeman and office assistant	2 00 per day	480 00		480 00
G. B. Fitzgerald	Axeman and office assistant	2 00 per day	684 00		684 00
Robert A. Gross	Axeman and office assistant	2 00 per day	54 00		54 00
Byron Houghtaling	Axeman and office assistant	2 00 per day	120 00		120 00
R. J. Maloy	Axeman and office assistant	2 00 per day	468 00		468 00
D. B. Mattice	Axeman and office assistant	2 00 per day	468 00		468 00
Julius Mishkin	Axeman and office assistant	2 00 per day	168 00		168 00
Nelson Mory	Axeman and office assistant	2 00 per day	10 00		10 00
J. J. Murnane	Axeman and office assistant	2 00 per day	646 00		646 00
George K. Shuler	Axeman and office assistant	2 00 per day	34 00		34 00
J. T. Smith	Axeman and office assistant	2 00 per day	42 00		42 00
P. D. Unger	Axeman and office assistant	2 00 per day	92 00		92 00
Sibella Carroll	Charwoman	1 25 per day	69 00		69 00
			$213,618 19	$39,436 25	$253,054 44
Incidental Expenses.					
Instruments, tools and appliances				$700 24	
Office rent				4,048 45	
Fuel and light				251 10	
Stationery and printing				10,974 60	
Postage				816 43	
Telephone and telegraph				1,983 94	
Miscellaneous				14,795 38	
					33,570 14
Total					$286,624 58

Construction of Barge Canal — Erie Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Geo. D. Williams	Division engineer	$3,600 per year		$1,021 86	$1,021 86
J. A. O'Connor	First resident engineer	2,700 per year	$603 57	24 57	628 14
E. J. Pickwick	Resident engineer	2,700 per year	2,650 00	435 91	3,085 91
P. H. Dater	Resident engineer	2,700 per year	2,425 00	506 06	2,931 06
E. A. Lamb	Resident engineer	2,400 per year	400 00	71 13	471 13
C. H. MacCulloch	Resident engineer	2,400 per year	1,109 68	88 71	1,198 39
C. Arthur Poole	Resident engineer	2,400 per year	2,400 00	63 39	2,463 39
S. M. Savage	Resident engineer	2,400 per year	800 00	89 68	889 68
F. P. Williams	Resident engineer	2,700 per year	2,425 00	280 14	2,705 14
R. D. Parsons	Financial clerk	5 00 per day	785 00		785 00
Parkes D. Wendell	Estimate clerk	175 per month	825 00	34 45	859 45
B. L. Fredendall	Stenographer	150 per month	200 00		200 00
Harriet L. Davis	Stenographer	88 33 per month	83 33		83 33
Bertha E. Kirchner	Stenographer	60 00 per month	660 00		660 00
J. A. Murray	Stenographer	60 00 per month	8 00		8 00
S. A. Smith	Stenographer	60 00 per month	44 52		44 52

Construction of Barge Canal — Erie Canal — (Continued).

NAME.	Rank.	Rate of compensation	Services.	Travel.	Total.
L. L. Watkins	Stenographer	$60 00 per month	$590 00		$590 00
L. H. Hurd	Clerk	112 50 per month	975 00		975 00
E. H. Bourne	Engineering draftsman	5 00 per day	1,070 00		1,070 00
T. S. Bailey	Engineering draftsman	4 50 per day	621 00		621 00
Ford W. Harris	Engineering draftsman	4 00 per day	1,394 00		1,394 00
R. H. Warrin	Engineering draftsman	4 00 per day	1,272 00		1,272 00
C. S. Allen	Tracer	75 00 per month	653 23		653 23
A. G. Austin	Assistant engineer	6 00 per day	1,875 00	$49 83	1,924 83
Lewis Bartlett	Assistant engineer	6 00 per day	2 022 00	192 06	2,214 06
E. J. Becker	Assistant engineer	6 00 per day	1,992 00	7 20	1,999 20
J. C. Bell	Assistant engineer	6 00 per day	1,913 00	544 97	2,457 97
D. E. Bellows	Assistant engineer	6 00 per day	1,986 00	568 88	2,554 88
Fred. W. Harris	Assistant engineer	6 00 per day	2,016 00	52 30	2,068 30
E. D. Hendricks	Assistant engineer	6 00 per day	1,992 00	377 00	2,369 00
Edwin Hilborn	Assistant engineer	6 00 per day	1,884 00	533 02	2,417 02
L. S. Hulburd	Assistant engineer	6 00 per day	1,296 00	4 00	1,300 00
M. E. James	Assistant engineer	6 00 per day	2,082 00	14 61	2,096 61
E. E. Kendall	Assistant engineer	6 00 per day	1,358 00	259 11	1,617 11
D. R. Lee	Assistant engineer	6 00 per day	192 00	4 42	196 42
O. F. Lewis	Assistant engineer	6 00 per day	1,979 00	35 33	2,014 33
J. B. Maguire	Assistant engineer	6 00 per day	1,860 00		1,860 00
I. S. Matlaw	Assistant engineer	6 00 per day	2,064 00	532 31	2,596 31
C. L. McClelland	Assistant engineer	6 00 per day	1,980 00		1,980 00
Geo. I. Oakley	Assistant engineer	6 00 per day	1,890 00	447 63	2,337 63
P. W. O'Grady	Assistant engineer	6 00 per day	366 00	59 20	425 20
B. W. Rosekrans	Assistant engineer	6 00 per day	36 00		36 00
H. O. Schermerhorn	Assistant engineer	6 00 per day	36 00		36 00
A. E. Steere	Assistant engineer	6 00 per day	1,932 00	36 09	1,968 09
G. G. Underhill	Assistant engineer	6 00 per day	54 00	1 98	55 98
W. J. Weigmann	Assistant engineer	6 00 per day	2,033 00	463 41	2,496 41
M. J. Williams	Assistant engineer	6 00 per day	1,476 00	188 01	1,664 01
C. A. Holmquist	Assistant engineer	5 00 per day	305 00		305 00
E. P. Neuschwander	Assistant engineer	5 00 per day	1,650 00	83 74	1,733 74
H. R. Robbins	Assistant engineer	5 00 per day	380 00	35 60	415 60
E. M. Babcock	Leveler	5 00 per day	1,520 50		1,520 50
C. R. DeGraff	Leveler	5 00 per day	1,391 50		1,391 50
M. W. Grimes	Leveler	5 00 per day	1,528 50		1,528 50
Jacob Friedland	Leveler	5 00 per day	600 00		600 00
Oscar Hasbrouck	Leveler	5 00 per day	1,360 00	1 20	1,361 20
C. L. Hayward	Leveler	5 00 per day	1,534 50		1,534 50
T. A. Hendrickson	Leveler	5 00 per day	515 00		515 00
Grant Huntley	Leveler	5 00 per day	1,651 50	67 30	1,718 80
C. G. Ranney	Leveler	5 00 per day	1,565 00		1,565 00
J. L. Sawyer	Leveler	5 00 per day	670 00		670 00
S. R. Tighe	Leveler	5 00 per day	1,570 00		1,570 00
C. E. Weed	Leveler	5 00 per day	1,556 50	37 69	1,594 19
W. E. Weller	Leveler	5 00 per day	1,537 00	50 26	1,587 26
J. D. Williams	Leveler	5 00 per day	1,542 50		1,542 50
S. R. Bellows	Leveler	4 50 per day	1,579 50		1,579 50
R. M. Bennett	Leveler	4 50 per day	382 50		382 50
Otto Brown	Leveler	4 50 per day	510 00		510 00
C. F. DeClercq	Leveler	4 50 per day	1,363 50		1,363 50
I. A. Farquhar	Leveler	4 50 per day	1,026 00		1,026 00
Eustace Hulsapple	Leveler	4 50 per day	1,467 00		1,467 00
G. C. Ingersoll	Leveler	4 50 per day	535 50		535 50
D. W. Overocker	Leveler	4 50 per day	832 50		832 50
J. S. Bixby	Rodman	4 00 per day	1,244 00		1,244 00
C. S. Dietz	Rodman	4 00 per day	1,212 00		1,212 00
J. A. Glominski	Rodman	4 00 per day	1,144 50		1,144 50
W. C. Rich	Rodman	4 00 per day	1,224 00		1,224 00
H. J. Richardson	Rodman	4 00 per day	612 00	185 30	797 30
H. S. Silvester	Rodman	4 00 per day	335 50		335 00
R. B. Smith	Rodman	4 00 per day	1,240 50		1,240 50
Geo. Van Nostrand	Rodman	4 00 per day	1,174 50		1,174 50
W. W. Brown	Rodman	3 50 per day	371 00		371 00
N. E. Cottrell	Rodman	3 50 per day	143 50		143 50
R. E. Demming	Rodman	3 50 per day	87 50		87 50
R. E. Drake	Rodman	3 50 per day	507 50		507 50
Ely Gamse	Rodman	3 50 per day	374 50		374 50
E. W. Goff	Rodman	3 50 per day	1,214 50		1,214 50
R. W. Heerlein	Rodman	3 50 per day	35 00		35 00
G. H. Jones	Rodman	3 50 per day	315 00		315 00
A. D. Kline	Rodman	3 50 per day	480 00		480 00
P. F. Matteson	Rodman	3 50 per day	45 50		45 50
Wm. N. Niles	Rodman	3 50 per day	119 00		119 00

Construction of Barge Canal — Erie Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. J. Schworm	Rodman	$3 50 per day	$728 00	....	$728 00
Nial Sherwood	Rodman	3 50 per day	357 00	....	357 00
H. J. Stevens	Rodman	3 50 per day	385 00	....	385 00
C. H. Adams	Chainman	3 00 per day	684 00	....	684 00
C. E. Anderson	Chainman	3 00 per day	900 00	....	900 00
F. C. Armstrong	Chainman	3 00 per day	933 00	....	933 00
H. F. Eagan	Chainman	3 00 per day	168 00	....	168 00
F. E. Gillen	Chainman	3 00 per day	1,011 00	....	1,011 00
W. M. Griffith	Chainman	3 00 per day	594 50	....	594 50
Raymond Jerrell	Chainman	3 00 per day	798 00	....	798 00
T. Loonie	Chainman	3 00 per day	872 00	....	872 00
A. R. Mulligan	Chainman	3 00 per day	834 00	....	834 00
H. P. O'Bryan	Chainman	3 00 per day	159 00	....	159 00
D. T. Simpson	Chainman	3 00 per day	243 00	....	243 00
F. B. Stoddard	Chainman	3 00 per day	990 00	....	990 00
F. L. Teall	Chainman	3 00 per day	928 00	....	928 00
J. R. Tighe	Chainman	3 00 per day	880 00	....	880 00
C. A. Wilbur	Chainman	3 00 per day	663 50	....	663 50
M. W. Wohlgemuth	Chainman	3 00 per day	522 00	....	522 00
H. C. Young	Chainman	3 00 per day	537 00	....	537 00
J. A. Young	Chainman	3 00 per day	912 00	....	912 00
G. L. Barrus	Chainman	2 50 per day	37 50	....	37 50
H. V. Button	Chainman	2 50 per day	357 50	....	357 50
J. L. Doyle	Chainman	2 50 per day	837 50	....	837 50
Jacob Gadlowitz	Chainman	2 50 per day	267 50	....	267 50
Arthur O Hollenbeck	Chainman	2 50 per day	237 50	....	237 50
A. A. Laughlin	Chainman	2 50 per day	429 00	....	429 00
John Lyons	Chainman	2 50 per day	412 50	....	412 50
F. H. Macy	Chainman	2 50 per day	247 50	....	247 50
L. Y. Meneely	Chainman	2 50 per day	372 50	....	372 50
A. D. Merrill	Chainman	2 50 per day	90 00	....	90 00
W. W. Moyer	Chainman	2 50 per day	245 00	....	245 00
E. S. Overbaugh	Chainman	2 50 per day	5 00	....	5 00
Wm. Robinson	Chainman	2 50 per day	65 00	....	65 00
C. B. Tebo	Chainman	2 50 per day	852 50	....	852 50
H. J. Waldvogel	Chainman	2 50 per day	393 00	....	393 00
F. B. Watson	Chainman	2 50 per day	160 00	....	160 00
L. H. Wright	Chainman	2 50 per day	92 50	....	92 50
A. M. Wait	Inspector of public works	5 00 per day	810 00	....	810 00
E. V. Allendorph	Inspector of masonry	5 00 per day	680 00	....	680 00
W. W. Barclay	Inspector of masonry	5 00 per day	490 00	....	490 00
L. C. Dedrick	Inspector of masonry	5 00 per day	395 00	....	395 00
T. F. Fagan	Inspector of masonry	5 00 per day	1,699 00	....	1,699 00
E. L. Keeler	Inspector of masonry	5 00 per day	1,348 00	....	1,348 00
Thos. R. McCann	Inspector of masonry	5 00 per day	445 00	....	445 00
Jas. Sim	Inspector of masonry	5 00 per day	994 00	$5 58	999 58
W. H. H. Klinkhart	Inspector of masonry	4 50 per day	1,449 00	....	1,449 00
Charles M. Leet	Inspector of masonry	4 50 per day	27 00	....	27 00
S. Y. Mac Gregor	Inspector of masonry	4 50 per day	1,406 50	....	1,406 50
T. M. Oliver	Inspector of masonry	4 50 per day	1,485 00	....	1,485 00
J. M. Taylor	Inspector of masonry	4 50 per day	516 00	....	516 00
J. A. Cahalin	Inspector of masonry	4 00 per day	1,412 00	....	1,412 00
H. B. Finan	Inspector of masonry	4 00 per day	1,376 00	....	1,376 00
J. E. Foote	Inspector of masonry	4 00 per day	340 00	....	340 00
G. M. Harrer	Inspector of masonry	4 00 per day	384 00	....	384 00
H. E. Hillier	Inspector of masonry	4 00 per day	400 00	....	400 00
O. T. Humphrey	Inspector of masonry	4 00 per day	368 00	....	368 00
H. L. Kennedy	Inspector of masonry	4 00 per day	1,372 00	....	1,372 00
Wm. P. Lynch	Inspector of masonry	4 00 per day	1,236 00	....	1,236 00
T. J. Mangin	Inspector of masonry	4 00 per day	204 00	....	204 00
F. J. Tilton	Inspector of masonry	4 00 per day	104 00	....	104 00
R. E. Bierce	Inspector of masonry	3 50 per day	45 50	....	45 50
A. W. Gillis	Inspector of masonry	3 50 per day	220 50	1 51	222 01
J. E. Magowan	Inspector of masonry	3 50 per day	836 00	....	836 00
W. H. Breen	Inspector of masonry	4 50 per day	445 50	....	445 50
Hugh Henderson	Inspector of masonry	4 00 per day	202 50	....	202 50
M. V. McCoy	Foreman of borings	3 50 per day	486 50	3 85	490 35
Jas. Clark	Boatman	3 00 per day	117 00	....	117 00
John Clark	Boatman	3 00 per day	174 00	....	174 00
J. H. Dolan	Boatman	3 00 per day	654 00	....	654 00
E. A. Faille	Boatman	3 00 per day	291 00	....	291 00
J. J. Farrell	Boatman	3 00 per day	291 00	....	291 00
W. L Gillette	Boatman	3 00 per day	315 00	....	315 00
J. L. Ha burger	Boatman	3 00 per day	207 00	....	207 00
T. P. Humbler	Boatman	3 00 per day	108 00	....	108 00

Construction of Barge Canal — Erie Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Jas. Lair	Boatman	$3 00 per day	$333 00		$333 00
M. E. Mullaney	Boatman	3 00 per day	286 00		286 00
C. S. Sterling	Boatman	3 00 per day	270 00		270 00
M. J. Waters	Boatman	3 00 per day	180 00		180 00
G. W. Waters	Boatman	3 00 per day	192 00		192 00
Wm. Wilson	Boatman	3 00 per day	75 00		75 00
F. S. Belotti	Laborer	2 00 per day	8 00		8 00
F. A. Boltwood	Laborer	2 00 per day	642 00		642 00
Thos. Brennan	Laborer	2 00 per day	166 00		166 00
J. W. Carney	Laborer	2 00 per day	158 00		158 00
P. E. Collette	Laborer	2 00 per day	286 00		286 00
J. E. Collins	Laborer	2 00 per day	116 00		116 00
Thos. Collins	Laborer	2 00 per day	220 00		220 00
W. B. Colyer	Laborer	2 00 per day	84 00		84 00
Wm. P. Deevey	Laborer	2 00 per day	138 00		138 00
R. A. Donaldson	Laborer	2 00 per day	396 00		396 00
J. C. Dougherty	Laborer	2 00 per day	126 00		126 00
Wm. Fader	Laborer	2 00 per day	218 00		218 00
J. C. Fennell	Laborer	2 00 per day	106 00		106 00
Jas. P. Fox	Laborer	2 00 per day	190 00		190 00
W. G. Gass	Laborer	2 00 per day	218 00		218 00
T. H. Glavin	Laborer	2 00 per day	186 00		186 00
Michael Goldschmidt	Laborer	2 00 per day	132 00		132 00
Howard Graham	Laborer	2 00 per day	186 00		186 00
Owen Hagerty	Laborer	2 00 per day	116 00		116 00
J. C. Hayes	Laborer	2 00 per day	196 00		196 00
A. O. Hollenbeck	Laborer	2 00 per day	78 00		78 00
Herman Horwald	Laborer	2 00 per day	8 00		8 00
T. A. Keane	Laborer	2 00 per day	450 00		450 00
John Lavery	Laborer	2 00 per day	664 00		664 00
John Loughlin	Laborer	2 00 per day	174 00		174 00
Edgar Lynd	Laborer	2 00 per day	296 00		296 00
Henry Mac Farlane	Laborer	2 00 per day	204 00		204 00
T. F. Madden	Laborer	2 00 per day	162 00		162 00
Michael Mahoney	Laborer	2 00 per day	132 00		132 00
M. McConnell	Laborer	2 00 per day	380 00		380 00
L. W. McHenry	Laborer	2 00 per day	18 00		18 00
David Morris	Laborer	2 00 per day	132 00		132 00
M. E. Mullaney	Laborer	2 00 per day	310 00		310 00
Leonard Paige	Laborer	2 00 per day	276 20		276 20
G. R. Rankin	Laborer	2 00 per day	370 00		370 00
Florence Riordan	Laborer	2 00 per day	8 00		8 00
F. W. Russell	Laborer	2 00 per day	132 00		132 00
Samuel Schwartz	Laborer	2 00 per day	256 00		256 00
Andrew Seaman	Laborer	2 00 per day	124 00		124 00
G. C. Secord	Laborer	2 00 per day	40 00		40 00
Jas. Sherry, Jr.	Laborer	2 00 per day	134 00		134 00
Jas. Shaughnessy	Laborer	2 00 per day	126 00		126 00
Melvin Van Slyke	Laborer	2 00 per day	10 00		10 00
D. J. Vaughn	Laborer	2 00 per day	54 00		54 00
M. F. Wemple	Laborer	2 00 per day	120 00		120 00
Robert Wemple	Laborer	2 00 per day	54 00		54 00
Wm. Wolf	Laborer	2 00 per day	360 00		360 00
C. B. Zimmer	Laborer	2 00 per day	22 00		22 00
A. J. Banker	Axeman and office assistant	2 00 per day	482 00		482 00
Alexander Bayly	Axeman and office assistant	2 00 per day	308 00		308 00
E. L. Bennett	Axeman and office assistant	2 00 per day	52 00		52 00
E. A. Blakeslee	Axeman and office assistant	2 00 per day	206 00		206 00
E. J. Bradley	Axeman and office assistant	2 00 per day	138 00		138 00
J. G. Bushnell	Axeman and office assistant	2 00 per day	116 00		116 00
E. J. Daly	Axeman and office assistant	2 00 per day	140 00		140 00
W. A. Dawson	Axeman and office assistant	2 00 per day	376 00		376 00
L. F. Hichman	Axeman and office assistant	2 00 per day	170 00		170 00
E. B. Hollenbeck	Axeman and office assistant	2 00 per day	500 00	$1 35	501 35
Archibald Hughes	Axeman and office assistant	2 00 per day	216 00		216 00
J. P. Hughes	Axeman and office assistant	2 00 per day	582 00		582 00
F. O. Johnson	Axeman and office assistant	2 00 per day	160 00		160 00
H. W. Loftus	Axeman and office assistant	2 00 per day	8 00		8 00
Wm. Mangan	Axeman and office assistant	2 00 per day	432 00		432 00
Julius Mishkin	Axeman and office assistant	2 00 per day	168 00		168 00
D. I. O'Leary	Axeman and office assistant	2 00 per day	282 00		282 00
E. S. Palmer	Axeman and office assistant	2 00 per day	100 00		100 00
R. E. Palmer	Axeman and office assistant	2 00 per day	392 00		392 00
Wm. Robinson	Axeman and office assistant	2 00 per day	296 00		296 00
F. H. Thomas	Axeman and office assistant	2 00 per day	162 00		162 00

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Construction of Barge Canal — Erie Canal — (Concluded).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
L. E. Thompson	Axeman and office assistant	$2 00 per day	$344 00		$344 00
F. T. Sheldon	Axeman and office assistant	2 00 per day	140 00		140 00
W. J. Van Hoesen	Axeman and office assistant	2 00 per day	102 00		102 00
H. J. Weir	Axeman and office assistant	2 00 per day	428 00		428 00
C. W. Young	Gage reader	14 00 per month	140 00		140 00
G. J. Abel	Gage reader	7 00 per month	52 50		52 50
Godfrey Aman	Gage reader	7 00 per month	84 00		84 00
C. V. Barrett	Gage reader	5 00 per month	60 00		60 00
Wm. Butler	Gage reader	7 00 per month	56 00		56 00
A. D. Coshun	Gage reader	7 00 per month	3 39		3 39
R. A. Donaldson	Gage reader	7 00 per month	3 50		3 50
Henry Edick, Jr	Gage reader	7 00 per month	84 00		84 00
Harrison Fitch	Gage reader	7 00 per month	76 84		76 84
G. W. Flansburg	Gage reader	7 00 per month	17 84		17 84
J. D. Hambrecht	Gage reader	7 00 per month	58 71		58 71
Herbert Hockle	Gage reader	7 00 per month	25 29		25 29
E. L. Hoffman	Gage reader	7 00 per month	56 00		56 00
J. V. Mackey	Gage reader	7 00 per month	56 00		56 00
R. S. Marshall	Gage reader	7 00 per month	52 00		52 00
Frank McArthur	Gage reader	7 00 per month	63 00		63 00
E. J. Nelson	Gage reader	7 00 per month	42 00		42 00
P. C. Picard	Gage reader	7 00 per month	56 00		56 00
Michael Powers	Gage reader	5 00 per month	25 00		25 00
J. Reepmeyer, Jr	Gage reader	7 00 per month	84 00		84 00
A. M. Spencer	Gage reader	7 00 per month	56 00		56 00
John Stark	Gage reader	7 00 per month	56 00		56 00
J. J. Vrooman	Gage reader	7 00 per month	14 00		14 00
Wm. C. Vrooman	Gage reader	7 00 per month	42 00		42 00
Minnie E. Wheeler	Gage reader	7 00 per month	84 00		84 00
C. J. Wood	Gage reader	7 00 per month	25 29		25 29
W. E. Young	Gage reader	7 00 per month	56 00		56 00
Robert Wilson	Gage reader	6 00 per month	72 00		72 00
John Fernald	Gage reader	5 00 per month	60 00		60 00
H. M. Hoag	Gage reader	5 00 per month	40 00		40 00
Lloyd Kast	Gage reader	5 00 per month	60 00		60 00
J. J. Gilbert	Gage reader	3 00 per month	36 00		36 00
			$159,611 89	$7,460 64	$167,072 53

Incidental Expenses.

Instruments, tools and appliances	$640 61	
Office rent	1,425 34	
Fuel and light	498 94	
Stationery and printing	309 10	
Postage	205 15	
Telephone and telegraph	1,046 58	
Miscellaneous	7,440 00	
		11,565 72
Total		$178,638 25

Construction of Barge Canal — Champlain Canal.

Chapter 147, Laws of 1903, and amendatory laws.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Geo. D. Williams	Division engineer	$3,600 per year		$728 69	$728 69
John A. O'Connor	First resident engineer	2,700 per year	$821 13	69 41	890 54
James Burden	Resident engineer	2,400 per year	2,400 00	89 59	2,489 59
Fred C. Davis	Resident engineer	2,400 per year	670 96	251 01	921 97
E. V. R. Payne	Resident engineer	2,400 per year	2,400 00	233 73	2,633 73
F. N. Sanders	Resident engineer	2,700 per year	2,025 00	266 26	2,291 26
E. G. Semon	Bridge designer	125 00 per month	187 50	6 63	194 13
R. D. Parsons	Financial clerk	5 00 per day	390 00		390 00
Charles Stark	Financial clerk	5 00 per day	125 00		125 00

Construction of Barge Canal — Champlain Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Parkes D. Wendell	Estimate clerk	$175 00 per month	$725 00	$9 46	$734 46
Georgina Pflaum	Stenographer	75 00 per month	900 00	.....	900 00
Jas. E. Phinney, Jr.	Stenographer	75 00 per month	900 00	17 28	917 28
Anne T. Russell	Temporary stenographer	2 00 per day	4 00	.....	4 00
L. H. Hurd	Clerk	112 50 per month	337 50	.....	337 50
Chas. B. Dunham, Jr.	Clerk	100 00 per month	400 00	.....	400 00
F. B. Holmes	Engineering draftsman	5 00 per day	1,600 00	.....	1,600 00
W. L. Caler	Engineering draftsman	4 50 per day	1,032 50	3 05	1,035 55
J. A. Galvin	Engineering draftsman	4 50 per day	1,485 00	.....	1,485 00
D. E. Damon	Engineering draftsman	4 00 per day	1,264 00	.....	1,264 00
J. B. Egbert	Engineering draftsman	4 00 per day	228 00	.....	228 00
J. E. Hall	Engineering draftsman	4 00 per day	1,298 50	.....	1,298 50
R. W. Scott	Tracer	75 00 per month	900 00	.....	900 00
I. L. Stalker	Tracer	75 00 per month	900 00	.....	900 00
Leon W. Fuller	Tracer	50 00 per month	164 52	.....	164 52
S. W. Belding	Assistant engineer	6 00 per day	1,968 00	489 76	2,457 76
H. W. Benedict	Assistant engineer	6 00 per day	1,092 00	77 20	1,169 20
C. A. Curtis	Assistant engineer	6 00 per day	2,088 00	331 50	2,419 50
R. D. Hayes	Assistant engineer	6 00 per day	1,440 00	88 95	1,528 95
L. T. Howard	Assistant engineer	6 00 per day	1,500 00	140 15	1,640 15
D. B. LaDu	Assistant engineer	6 00 per day	2,094 00	2,242 14	4,336 14
David R. Lee	Assistant engineer	6 00 per day	42 00	6 65	48 65
A. C. Richards	Assistant engineer	6 00 per day	1,896 00	179 99	2,075 99
Harry Shoemaker	Assistant engineer	6 00 per day	1,908 00	448 73	2,356 73
W. B. Watson	Assistant engineer	6 00 per day	2,034 00	442 29	2,476 29
B. I. Hall	Assistant engineer	5 00 per day	1,520 00	.....	1,520 00
LeGrand Sterling	Assistant engineer	5 00 per day	455 00	.....	455 00
W. C. Benedict	Leveler	5 00 per day	1,582 00	296 34	1,878 34
Jas. K. Brown	Leveler	5 00 per day	185 00	.....	185 00
Jas. B. Foote	Leveler	5 00 per day	1,605 00	.....	1,605 00
R. G. Gibson	Leveler	5 00 per day	1,536 50	.....	1,536 50
J. C. Gotwals	Leveler	5 00 per day	1,112 50	3 80	1,116 30
T. A. Hendrickson	Leveler	5 00 per day	130 00	.....	130 00
W. T. Hunt	Leveler	5 00 per day	1,250 00	.....	1,250 00
John McBride	Leveler	5 00 per day	1,540 00	.....	1,540 00
Raymond Sickles	Leveler	5 00 per day	150 00	.....	150 00
A. W. Smith	Leveler	5 00 per day	40 00	.....	40 00
M. J. Bartley	Leveler	4 50 per day	342 00	.....	342 00
E. H. Hussey	Leveler	4 50 per day	1,319 00	.....	1,319 00
L. S. Rickard	Leveler	4 50 per day	697 50	.....	697 50
R. N. Barrett	Rodman	4 00 per day	1,314 50	.....	1,314 50
H. L. Clark	Rodman	4 00 per day	1,256 00	.....	1,256 00
C. M. Colony	Rodman	4 00 per day	492 00	.....	492 00
F. J. Doerhoeffer	Rodman	4 00 per day	1,112 00	.....	1,112 00
J. S. Greenough	Rodman	4 00 per day	372 00	.....	372 00
B. T. Kenyon	Rodman	4 00 per day	1,345 50	.....	1,345 50
L. A. Meron	Rodman	4 00 per day	376 50	.....	376 50
A. R. Morse	Rodman	4 00 per day	1,232 50	.....	1,262 50
H. J. Richardson	Rodman	4 00 per day	524 00	174 88	698 88
E. W. Wendell	Rodman	4 00 per day	1,178 50	.....	1,178 50
W. C. Bratton	Rodman	3 50 per day	952 00	5 03	957 03
J. B. Doughty	Rodman	3 50 per day	752 50	.....	752 50
J. B. Rothberg	Rodman	3 50 per day	325 50	.....	325 50
A. E. Roche	Rodman	3 50 per day	24 50	3 16	27 66
J. J. Schworm	Rodman	3 50 per day	24 50	.....	24 50
Jas. M. Wilson	Chainman	3 00 per day	132 50	.....	132 50
M. W. Wohlgemuth	Chainman	3 00 per day	345 00	.....	345 00
A. E. Wood	Chainman	3 00 per day	322 00	.....	322 00
B. H. Boorn	Chainman	2 50 per day	275 00	.....	275 00
H. A. Born	Chainman	2 50 per day	210 00	.....	210 00
W. M. Bronk	Chainman	2 50 per day	720 00	4 63	724 63
Jacob Gadlowitz	Chainman	2 50 per day	142 50	.....	142 50
A. M. Wait	Inspector of public works	5 00 per day	855 00	.....	855 00
Luke Van Valkenburg	Inspector of public works	4 50 per day	336 00	.....	336 00
R. W. Fivey	Inspector of public works	3 50 per day	122 50	.....	122 50
Hugh Henderson	Inspector of public works	3 50 per day	161 00	.....	161 00
W. W. Barclay	Inspector of masonry	5 00 per day	593 00	.....	593 00
L. W. Donnelly	Inspector of masonry	5 00 per day	1,420 00	.....	1,420 00
F. B. Kraft	Inspector of masonry	4 00 per day	1,288 00	.....	1,288 00
C. M. Leet	Inspector of masonry	4 00 per day	804 00	.....	804 00
F. G. Tilton	Inspector of masonry	4 00 per day	1,156 00	.....	1,156 00
John J. McManus	Foreman of borings	4 50 per day	40 50	.....	40 50

Construction of Barge Canal — Champlain Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. J. Stoneburg	Foreman of borings	$4 00 per day	$665 00		$665 00
Chas. R Judson	Foreman of borings	3 50 per day	346 50		346 50
M. V. McCoy	Foreman of borings	3 50 per day	287 00	$4 20	291 20
Wm. K. Smith	Boatman	3 00 per day	432 00		432 00
Jas. Sweeney	Boatman	3 00 per day	78 00		78 00
Clarence Banker	Laborer	2 00 per day	128 00		128 00
Geo. C. Barton	Laborer	2 00 per day	136 00		136 00
A. N. Bennett	Laborer	2 00 per day	134 00		134 00
Fred Borden	Laborer	2 00 per day	24 00		24 00
Jas. Buck	Laborer	2 00 per day	80 00		80 00
Lewis Case	Laborer	2 00 per day	36 00		36 00
F. F. Clark	Laborer	2 00 per day	134 00		134 00
Wm. Collins	Laborer	2 00 per day	50 00		50 00
W. B. Collyer	Laborer	2 00 per day	140 00		140 00
J. H. Coniff	Laborer	2 00 per day	120 00		120 00
J. L. Curtin	Laborer	2 00 per day	80 00		80 00
S. H. Donaldson	Laborer	2 00 per day	132 00		132 00
Jas. Dudley	Laborer	2 00 per day	80 00		80 00
F. P. Duffy	Laborer	2 00 per day	228 00		228 00
Elmer Filkins	Laborer	2 00 per day	70 00		70 00
R. B. Fisher	Laborer	2 00 per day	94 00		94 00
B. Flansburg	Laborer	2 00 per day	22 00		22 00
T. E. Gaynor	Laborer	2 00 per day	80 00		80 00
T. H. Glavin	Laborer	2 00 per day	158 00		158 00
Daniel Goodwin	Laborer	2 00 per day	74 00		74 00
Howard Graham	Laborer	2 00 per day	142 00		142 00
Fred Jones	Laborer	2 00 per day	24 00		24 00
J. Jones	Laborer	2 00 per day	50 00		50 00
V. Jones	Laborer	2 00 per day	22 00		22 00
T. A. Keane	Laborer	2 00 per day	118 00		118 00
J. P. Kivlen	Laborer	2 00 per day	164 00		164 00
A. S. Knight	Laborer	2 00 per day	232 00		232 00
E. Larkin	Laborer	2 00 per day	46 00		46 00
Henry Mac Farlane	Laborer	2 00 per day	236 00		236 00
L. W. McHenry	Laborer	2 00 per day	120 00		120 00
N. H. McHerd	Laborer	2 00 per day	502 00		502 00
C. V. McMasters	Laborer	2 00 per day	326 00		326 00
John Muir	Laborer	2 00 per day	24 00		24 00
Bernard Murphy	Laborer	2 00 per day	72 00		72 00
Robert Newman	Laborer	2 00 per day	138 00		138 00
Leonard Page	Laborer	2 00 per day	208 00		208 00
C. H. Richardson	Laborer	2 00 per day	286 00		286 00
N. D. Richardson	Laborer	2 00 per day	124 00		124 00
John Rock	Laborer	2 00 per day	522 00		522 00
Leonard Ryan	Laborer	2 00 per day	34 00		34 00
Edward Shanahan	Laborer	2 00 per day	178 00		178 00
D. Sipperly	Laborer	2 00 per day	24 00		24 00
Frank Sprague	Laborer	2 00 per day	136 00		136 00
J. Tooze	Laborer	2 00 per day	22 00		22 00
Edward Wendell	Laborer	2 00 per day	306 00		306 00
W. H. Clapp	Axeman and office assistant	2 00 per day	262 00		262 00
F. B. Hall	Axeman and office assistant	2 00 per day	452 00		452 00
E. B. Hollenbeck	Axeman and office assistant	2 00 per day	148 00		148 00
Byron Houghtaling	Axeman and office assistant	2 00 per day	144 00		144 00
Wm. Maloney	Axeman and office assistant	2 00 per day	454 00		454 00
M. D. Mory	Axeman and office assistant	2 00 per day	570 00		570 00
J. J. Raup	Axeman and office assistant	2 00 per day	642 00		642 00
Thos. Ryan, Jr	Axeman and office assistant	2 00 per day	618 00		618 00
J. T. Smith	Axeman and office assistant	2 00 per day	128 00		128 00
F. H. Thomas	Axeman and office assistant	2 00 per day	104 00		104 00
L. C. Brasier	Gage reader	12 00 per month	144 00		144 00
E. H. Bowker	Gage reader	7 00 per month	56 00		56 00
S. L. Cluett	Gage reader	7 00 per month	56 00		56 00
W. J. Curtis	Gage reader	7 00 per month	14 00		14 00
J. H. Donnelly	Gage reader	7 00 per month	84 00		84 00
W. E. Downing	Gage reader	7 00 per month	84 00		84 00
W. B. Dunstan	Gage reader	7 00 per month	84 00		84 00
A. B. Fisher	Gage reader	7 00 per month	56 00		56 00
H. C. Funstan	Gage reader	7 00 per month	49 00		49 00
Geo. Hammond	Gage reader	7 00 per month	84 00		84 00
T. E. Hickey	Gage reader	7 00 per month	147 68		147 68
W. D. La Bar	Gage reader	7 00 per month	84 00		84 00

[illegible] — Concluded.

NAME	RANK	Rate of compensation	Services	Travel	Total
[illegible]	[illegible]	[illegible]	$84 [illegible]		$84 00
[illegible]	[illegible]	[illegible]	[illegible]		7 00
[illegible]	[illegible]	[illegible]	[illegible]		84 00
[illegible]	[illegible]	[illegible]	[illegible]		84 00
[illegible]	[illegible]	[illegible]	[illegible]		84 00
[illegible]	[illegible]	[illegible]	[illegible]		[illegible] 00
[illegible]	[illegible]	[illegible]	[illegible]		[illegible] 06
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
			$84 [illegible]	$[illegible]	$[illegible] 363 42

Incidental Expenses.

[illegible]	$[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	448 [illegible]	
[illegible]	3 [illegible]	
		5 [illegible]
Total		$[illegible] 393 03

Improvement of Public Highways.

[illegible]

[illegible]

NAME	RANK	Rate of compensation	Services	Travel	Total
L E [illegible]	[illegible]	$[illegible]		$[illegible]	$221 10
[illegible]	[illegible]	[illegible]	$[illegible]	[illegible]	1,016 29
[illegible]	[illegible]	[illegible]	[illegible] 47	[illegible]	[illegible] 90
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1 [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 99
[illegible]	[illegible]	[illegible]	[illegible]	145 [illegible]	1,0[illegible] 00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 51	946 94
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 19	1,304 62
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,1[illegible] 40
[illegible]	[illegible]	[illegible]	[illegible]	45 [illegible]	345 53
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	356 00
[illegible]	[illegible] expert	[illegible]	1 [illegible]	[illegible] 45	1 [illegible] 45
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	936 93
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 31	1,0[illegible] 50
[illegible]	[illegible]	[illegible]	[illegible]		135 00
[illegible]	[illegible]	[illegible]	[illegible]	42 [illegible]	[illegible] 42
[illegible]	[illegible]	[illegible]	[illegible]	6 92	[illegible] 19
[illegible]	[illegible]	[illegible]	[illegible]		325 00
[illegible]	[illegible]	[illegible]	[illegible]		240 00
[illegible]	[illegible]	[illegible]	[illegible]		330 54
[illegible]	[illegible]	[illegible]	[illegible]		300 00
[illegible]	[illegible]	[illegible]	[illegible]		100 00
[illegible]	[illegible]	[illegible]	[illegible]		300 00
[illegible]	[illegible]	[illegible]	[illegible]		219 35
[illegible]	[illegible]	[illegible]	[illegible]		100 00
[illegible]	[illegible]	[illegible]	[illegible]		300 00
[illegible]	[illegible]	[illegible]	[illegible]		166 66
[illegible]	[illegible]	[illegible]	[illegible]		241 66
[illegible]	[illegible]	[illegible]	[illegible] 43		276 43
[illegible]	[illegible]	[illegible]	[illegible]		230 36
[illegible]	[illegible]	[illegible]	[illegible]		80 65
[illegible] Jr	[illegible]	[illegible]	[illegible]	161 85	947 85
[illegible]	[illegible]	[illegible]	[illegible]	8 04	812 04
[illegible]	[illegible]	[illegible]	[illegible]		198 00
[illegible]	[illegible]	[illegible]	474 [illegible]	45 98	519 98
A [illegible]	[illegible]	[illegible]	[illegible]	426 31	972 31

Improvement of Public Highways — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
C. J. Dempsey	Assistant engineer	$6 00 per day	$42 00		$42 00
G. A. Ensign	Assistant engineer	6 00 per day		$4 34	4 34
J. C. Finch	Assistant engineer	6 00 per day	840 00	9 49	849 49
R. D. Hayes	Assistant engineer	6 00 per day	516 00	84 95	600 95
R. Hopkins	Assistant engineer	6 00 per day	768 00	28 00	796 00
L. T. Howard	Assistant engineer	6 00 per day	510 00	56 63	566 63
E. J. Howe	Assistant engineer	6 00 per day	720 00	52 70	772 70
H. C. Kline	Assistant engineer	6 00 per day	588 00	6 22	594 22
H. J. Langlois	Assistant engineer	6 00 per day	834 00	244 97	1,078 97
F. B. Morss	Assistant engineer	6 00 per day	750 00	56 30	806 30
F. J. Mullaney	Assistant engineer	6 00 per day	786 00	81 96	867 96
R. J. Murray	Assistant engineer	6 00 per day	720 00	120 09	840 09
G. H. Penfield	Assistant engineer	6 00 per day	720 00	43 18	763 18
E. G. Raynor	Assistant engineer	6 00 per day	474 00	15 63	489 63
J. H. Sturdevant	Assistant engineer	6 00 per day	588 00	109 10	697 10
E. W. Sylvester	Assistant engineer	6 00 per day	78 00	9 66	87 66
N. A. Taylor	Assistant engineer	6 00 per day	798 00	274 17	1,072 17
J. B. Wright	Assistant engineer	6 00 per day	720 00	138 17	858 17
M. J. Adams	Assistant engineer	5 00 per day	620 00	3 30	623 30
L. G. Bayly	Assistant engineer	5 00 per day	600 00		600 00
H. E. Blake	Assistant engineer	5 00 per day	600 00		600 00
G. M. Briggs	Assistant engineer	5 00 per day	495 00		495 00
F. H. Brundage	Assistant engineer	5 00 per day	615 00	14 78	629 78
L. W. Clark	Assistant engineer	5 00 per day	70 00		70 00
J. D. Colby	Assistant engineer	5 00 per day	535 00		535 00
W. G. Craig	Assistant engineer	5 00 per day	610 00	44 52	654 52
F. S. Crowell	Assistant engineer	5 00 per day	195 00	19 91	214 91
W. F. Farley	Assistant engineer	5 00 per day	600 00	9 52	609 52
C. T. Fisher	Assistant engineer	5 00 per day	564 00	48 81	612 81
P. L. Haas	Assistant engineer	5 00 per day	600 00	27 14	627 14
G. R. Halpin	Assistant engineer	5 00 per day	605 00	32 41	637 41
E. E. Kendall	Assistant engineer	5 00 per day	270 00	17 45	287 45
F. W. McKinney	Assistant engineer	5 00 per day	150 00	19 51	169 51
N. C. McNeill	Assistant engineer	5 00 per day	300 00		300 00
A. S. Mirick	Assistant engineer	5 00 per day	260 00	25 21	285 21
L. H. Parker	Assistant engineer	5 00 per day	620 00	72 10	692 10
C. P. Puegnet	Assistant engineer	5 00 per day	600 00	39 28	639 28
C. I. Peckham	Assistant engineer	5 00 per day	25 00	12 42	37 42
D. C. Roberts	Assistant engineer	5 00 per day	615 00	11 40	626 40
T. J. Schoenlaub	Assistant engineer	5 00 per day	640 00	21 69	661 69
G. C. See	Assistant engineer	5 00 per day	395 00		395 00
L. G. Sterling	Assistant engineer	5 00 per day	165 00	1 68	166 68
Edward Taylor	Assistant engineer	5 00 per day	595 00	63 13	658 13
D. J. Tonkonogy	Assistant engineer	5 00 per day	310 00	31 82	341 82
F. C. Woodward	Assistant engineer	5 00 per day	300 00	32 20	332 20
M. W. Wolff	Assistant engineer	5 00 per day	325 00	5 94	330 94
C. W. Diefendorf	Leveler	5 00 per day	630 00	1,092 33	1,722 33
Gordon Edson	Leveler	5 00 per day		21 39	21 39
T. A. Hendrickson	Leveler	5 00 per day	260 00		260 00
W. T. Hunt	Leveler	5 00 per day	430 00	28 98	458 98
Ralph Russell	Leveler	5 00 per day	160 00		160 00
A W. Smith	Leveler	5 00 per day	405 00	39 03	444 03
C. C. Ahles	Leveler	4 50 per day	558 00	75 93	633 93
M. J. Bartley	Leveler	4 50 per day	130 50		130 50
R. M. Bennett	Leveler	4 50 per day	148 50	2 65	151 15
H. W. Benkhart	Leveler	4 50 per day	270 00	4 55	274 55
E. R. Bitler	Leveler	4 50 per day	297 00	4 66	301 66
R. A. Caughey	Leveler	4 50 per day	279 00	7 14	286 14
C. R. DeGraff	Leveler	4 50 per day	202 50	74 51	277 01
J. J. Doyle	Leveler	4 50 per day	279 00	75	279 75
H. C. Ellis	Leveler	4 50 per day	540 00	3 95	543 95
O. L. Eltinge	Leveler	4 50 per day	76 50		76 50
I. A. Farquhar	Leveler	4 50 per day	396 00	13 32	409 32
E. B. Fox	Leveler	4 50 per day	99 00		99 00
S W. Gage	Leveler	4 50 per day	288 00	18 27	306 27
J. C. Gotwals	Leveler	4 50 per day	355 50	213 10	568 60
C. E. Gruner	Leveler	4 50 per day	549 00	51 97	600 97
H. N. Haight	Leveler	4 50 per day	522 00	16 00	538 00
J. J. Huber	Leveler	4 50 per day	520 00	4 43	524 43
A. J. Kaufman	Leveler	4 50 per day	540 00	198 63	738 63
L. J. McCarty	Leveler	4 50 per day	535 50	16 68	552 18
Harry Nathan	Leveler	4 50 per day	513 00	41 94	554 94
C. Osborne	Leveler	4 50 per day	540 00	20 76	560 76
J. A. Small	Leveler	4 50 per day	121 50	2 90	124 40

Improvement of Public Highways — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
W. J. Simpson	Leveler	$4 50 per day	$292 50	$8 35	$300 85
P. L. Spier	Leveler	4 50 per day	270 00	77 39	347 39
C. H. Stillman	Leveler	4 50 per day	544 50		544 50
D. D. Thomson	Leveler	4 50 per day	540 00	78 87	618 87
W. R. Trumbull	Leveler	4 50 per day	540 00	32 74	572 74
Louis Wachtel	Leveler	4 50 per day	531 00	5 58	536 58
Lee Walker	Leveler	4 50 per day	562 50	6 46	568 96
F. A. Bedell	Highway inspector	4 50 per day	519 00		549 00
H. R. Bedell	Highway inspector	4 50 per day	540 00		540 00
S. J. Bennett	Highway inspector	4 50 per day	598 50	84 13	682 63
G. L. Blauvelt	Highway inspector	4 50 per day	540 00	41 41	581 41
C. D. Boughton	Highway inspector	4 50 per day	504 00	33 77	537 77
Harry Bowen	Highway inspector	4 50 per day	531 00	902 80	1,433 80
J. T. Brady	Highway inspector	4 50 per day	598 50	231 24	829 74
W. H. Breen	Highway inspector	4 50 per day	139 50		139 50
A. B. Culver	Highway inspector	4 50 per day	292 50	12 97	305 47
R. J. Curtis	Highway inspector	4 50 per day	292 50	12 60	305 10
Blaine Gilday	Highway inspector	4 50 per day	540 00	82 51	622 51
L. L. Gowdy	Highway inspector	4 50 per day	612 00	324 79	936 79
L. Grossman	Highway inspector	4 50 per day	491 50	104 77	596 27
G. H. Harter	Highway inspector	4 50 per day	270 00	50 40	320 40
F. W. Hartwell	Highway inspector	4 50 per day	553 50	8 01	561 51
Hugh Henderson	Highway inspector	4 50 per day	130 50		130 50
R. O. Hollenbeck	Highway inspector	4 50 per day	500 50	1 45	501 95
W. E. L. Hunter	Highway inspector	4 50 per day	526 50		526 50
H. A. Knapp	Highway inspector	4 50 per day	567 00	1 80	568 80
J. R. Mahan	Highway inspector	4 50 per day	517 50	7 69	525 19
H. S. Mattimore	Highway inspector	4 50 per day	540 00	120 68	660 68
W. S. McLaughlin	Highway inspector	4 50 per day	553 50	16 75	570 25
W. J. McVay	Highway inspector	4 50 per day	540 00	25 56	565 56
B. E. Murray	Highway inspector	4 50 per day	567 00	46 10	613 10
J. E. Myers	Highway inspector	4 50 per day	562 50		562 50
J. J. O'Hara, Jr.	Highway inspector	4 50 per day	540 00	46 41	586 41
F. H. Owens	Highway inspector	4 50 per day	540 00	5 56	545 56
J. C. Patrick	Highway inspector	4 50 per day	544 50	275 02	819 52
W. M. Payne	Highway inspector	4 50 per day	540 00	7 18	547 18
H. E. Poole	Highway inspector	4 50 per day	589 50	45 04	634 54
A. W. Rogers	Highway inspector	4 50 per day	558 00	7 42	565 42
J. B. Ryder	Highway inspector	4 50 per day	589 50	14 82	604 32
G. V. Sherrill	Highway inspector	4 50 per day	566 00	16 15	582 15
T. H. Thyer	Highway inspector	4 50 per day	540 00	27 57	567 57
H. C. Titus	Highway inspector	4 50 per day	562 50	27 40	589 90
W. J. Ward	Highway inspector	4 50 per day	421 50	8 79	430 29
H. C. Wells	Highway inspector	4 50 per day	486 00		486 00
A. E. Weinholz	Highway inspector	4 50 per day	67 50	11 26	78 76
E. B. Garrison	Highway inspector	4 00 per day	544 00		544 00
H. L. Michael	Highway inspector	4 00 per day	500 00	13 65	513 65
E. C. Altenburg	Highway inspector	3 50 per day	427 00	1 93	428 93
C. C. Baker	Highway inspector	3 50 per day	420 00	7 70	427 70
D. J. Brown	Highway inspector	3 50 per day	413 00	5 92	418 92
H. A. Carroll	Highway inspector	3 50 per day	476 00		476 00
C. R. Cornwall	Highway inspector	3 50 per day	423 50	65 31	488 81
W. D. Covey	Highway inspector	3 50 per day	217 00	13 35	230 35
S. C. Denby	Highway inspector	3 50 per day	437 50	4 77	442 27
Wm. Dotie, Jr	Highway inspector	3 50 per day	420 00	18 42	438 42
R. W. Fivey	Highway inspector	3 50 per day	105 00	2 68	107 68
W. S. Gray	Highway inspector	3 50 per day	430 50	740 82	1,171 32
L. A. Guerber	Highway inspector	3 50 per day	213 50	25 96	239 46
J. V. Harrington	Highway inspector	3 50 per day	420 00	2 95	422 95
W. H. Hayes	Highway inspector	3 50 per day	210 00	4 05	214 05
B. E. Hodges	Highway inspector	3 50 per day	420 00	9 68	429 68
J. W. Holler	Highway inspector	3 50 per day	437 50	3 75	441 25
A. G. Horne	Highway inspector	3 50 per day	430 50	68 00	498 50
G. C. Hoyer	Highway inspector	3 50 per day	420 00	14 15	434 15
E. J. Kirk	Highway inspector	3 50 per day	423 50	3 83	427 33
G. H. Maher	Highway inspector	3 50 per day	224 00	22 41	246 41
W. G. Merritt	Highway inspector	3 50 per day	455 00	1 00	456 00
F. W. Mills	Highway inspector	3 50 per day	420 00	7 32	427 32
H. E. Reeves	Highway inspector	3 50 per day	420 00	4 81	424 81
John Schuman, Jr.	Highway inspector	3 50 per day	420 00	4 47	424 47
J. A. Thompson	Highway inspector	3 50 per day	217 00		217 00
Luke Van Valkenburg	Highway inspector	3 50 per day	115 50	4 60	120 10
E. F. Weeks	Highway inspector	3 50 per day	115 50		115 50
C. D. Burrus	Engineering draftsman	6 00 per day	636 00		636 00

Improvement of Public Highways — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
C. H. Chilvers	Engineering draftsman	$5 00 per day	$635 00	$73 08	$708 08
W. R. Gordon	Engineering draftsman	5 00 per day	600 00	606 04	1,206 04
H. W. Lockwood	Engineering draftsman	5 00 per day	485 00	19 69	504 69
M. W. Nelson	Engineering draftsman	5 00 per day	615 00	....	615 00
W. E. Petty	Engineering draftsman	5 00 per day	660 00	89 44	749 44
C. D. Sniggs	Engineering draftsman	5 00 per day	255 00	....	255 00
R. P. Campfield	Engineering draftsman	4 50 per day	553 50	5 60	559 10
C. H. Anrus	Engineering draftsman	4 00 per day	200 00	....	200 00
G. T. Bolton	Engineering draftsman	4 00 per day	480 00	....	480 00
G. F. Bond, Jr	Engineering draftsman	4 00 per day	480 00	17 04	497 04
W. L. Caler	Engineering draftsman	4 00 per day	360 00	18 75	378 75
A. Carrera	Engineering draftsman	4 00 per day	436 00	....	436 00
H. B. Coleman	Engineering draftsman	4 00 per day	512 00	3 63	515 63
J. B. Egbert	Engineering draftsman	4 00 per day	240 00	6 47	246 47
E. C. Hackett	Engineering draftsman	4 00 per day	132 00	8 70	140 70
A. T. Paine	Engineering draftsman	4 00 per day	512 00	....	512 00
J. D. Rutledge	Engineering draftsman	4 00 per day	440 00	71 94	511 94
W. A. Treadwell	Engineering draftsman	4 00 per day	476 00	3 30	479 30
R. F. T. Wilkie	Engineering draftsman	4 00 per day	304 00	6 54	310 54
C. S. Allen	Tracer	75 00 per month	246 77	....	246 77
J. S. Heath	Tracer	75 00 per month	345 54	....	345 54
J. D. Eltinger	Tracer	50 00 per month	230 36	....	230 33
Otto Brown	Rodman	4 00 per day	128 00	12 90	140 90
H. P. Condon	Rodman	4 00 per day	532 00	65 92	597 92
J. E. DeLee	Rodman	4 00 per day	520 00	13 84	533 84
F. J. Doerhoeffer	Rodman	4 00 per day	208 00	5 88	213 88
Warren Gardner	Rodman	4 00 per day	484 00	....	484 00
J. S. Greenough	Rodman	4 00 per day	120 00	13 19	133 19
F. J. Kenney	Rodman	4 00 per day	504 00	145 92	649 92
A. J. Muench	Rodman	4 00 per day	480 00	6 73	486 73
David Noonan	Rodman	4 00 per day	488 00	39 10	527 10
J. T. O'Hora	Rodman	4 00 per day	208 00	27 02	235 02
D. P. O'Neil	Rodman	4 00 per day	484 00	35 04	519 04
F. E. Reed	Rodman	4 00 per day	484 00	18 33	502 33
H. J. Richardson	Rodman	4 00 per day	16 00	15 63	31 63
R. H. Sammons	Rodman	4 00 per day	480 00	59 22	539 22
H. S. Silvester	Rodman	4 00 per day	128 00	14 75	142 75
H. T. Tuthill	Rodman	4 00 per day	492 00	40 01	532 01
D. P. Babcock	Rodman	3 50 per day	210 00	71 23	281 23
M. C. Barker	Rodman	3 50 per day	210 00	....	210 00
Pinus Brauner	Rodman	3 50 per day	217 00	....	217 00
W. C. Bratton	Rodman	3 50 per day	147 00	28 04	175 04
A. L. Bush	Rodman	3 50 per day	31 50	3 20	34 70
Samuel Ehrenrich	Rodman	3 50 per day	420 00	17 08	437 08
L. H. Johnson	Rodman	3 50 per day	210 00	19 72	229 72
P. D. Jump	Rodman	3 50 per day	220 50	10 08	230 58
A. D. Kline	Rodman	3 50 per day	164 50	77 62	242 12
H. R. Leland	Rodman	3 50 per day	416 50	24 66	441 16
Samuel Levine	Rodman	3 50 per day	420 00	7 69	427 69
P. F. Matteson	Rodman	3 50 per day	378 00	8 94	386 94
J. B. Rothberg	Rodman	3 50 per day	105 00	7 64	112 64
A. E. Roche	Rodman	3 50 per day	402 50	47 15	449 65
I. H. Segal	Rodman	3 50 per day	423 50	....	423 50
A. G. Slatcher	Rodman	3 50 per day	427 00	2 20	429 20
G. S. Donohue	Chainman	3 00 per day	369 00	25 16	394 16
H. L. Felch	Chainman	3 00 per day	366 00	20 36	386 36
F. McE. Pruyn	Chainman	3 00 per day	343 00	14 14	357 14
A. E. Wood	Chainman	3 00 per day	180 00	....	180 00
M. V. Bourke	Chainman	2 50 per day	310 00	1 50	311 50
Wm. Bronk	Chainman	2 50 per day	112 50	3 58	116 08
M. D. Dugan	Chainman	2 50 per day	260 00	91 31	351 31
John Delaney	Chainman	2 50 per day	254 00	....	254 00
M. I. Franklin	Chainman	2 50 per day	127 50	....	127 50
S. Hargen	Chainman	2 50 per day	157 50	....	157 50
R. Jerrel	Chainman	2 50 per day	82 50	....	82 50
E. K. Keneston	Chainman	2 50 per day	....	5 32	5 32
H. J. Kingsley	Chainman	2 50 per day	310 00	15 99	325 99
J. C. Lutkenhaus	Chainman	2 50 per day	150 00	11 31	161 31
V. Markle	Chainman	2 50 per day	312 50	....	312 50
C. A. Wilbur	Chainman	2 50 per day	147 50	65 39	212 89
W. B. Anderson	Axeman and office assistant	2 00 per day	236 00	5 08	241 08
E. L. Bennett	Axeman and office assistant	2 00 per day	120 00	90 71	210 71
L. M. Butler	Axeman and office assistant	2 00 per day	136 00	5 80	141 80
J. J. Brennam	Axeman and office assistant	2 00 per day	242 00	22 11	264 11

Improvement of Public Highways — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. R. Caine	Axeman and office assistant	$2 00 per day	$246 00	$20 98	$266 98
A. A. Carroll	Axeman and office assistant	2 00 per day	132 00	4 36	136 36
J. B. Carroll	Axeman and office assistant	2 00 per day	128 00	....	128 00
L. F. Cashman	Axeman and office assistant	2 00 per day	190 00	....	190 00
F. D. W. Connelly	Axeman and office assistant	2 00 per day	150 00	2 23	152 23
M. Conroy	Axeman and office assistant	2 00 per day	108 00	36 18	144 18
W. R. Davis	Axeman and office assistant	2 00 per day	108 00	....	108 00
C. C. Donohue	Axeman and office assistant	2 00 per day	122 00	20 18	142 18
G. I. Dugan	Axeman and office assistant	2 00 per day	236 00	....	236 00
D. Dworsack	Axeman and office assistant	2 00 per day	....	14 92	14 92
G. F. Eschwei	Axeman and office assistant	2 00 per day	252 00	30 26	282 26
R. E. Faust	Axeman and office assistant	2 00 per day	120 00	25 74	145 74
W. C. Fox	Axeman and office assistant	2 00 per day	242 00	25 56	267 56
T. I. Frederick	Axeman and office assistant	2 00 per day	104 00	53 81	157 81
W. F. Gaffney	Axeman and office assistant	2 00 per day	230 00	76 20	306 20
J. H. Garland	Axeman and office assistant	2 00 per day	208 00	8 79	216 79
J. J. Glynn	Axeman and office assistant	2 00 per day	184 00	....	184 00
T. F. Guiders	Axeman and office assistant	2 00 per day	240 00	5 33	245 33
J. J. Hagan	Axeman and office assistant	2 00 per day	122 00	28 36	150 36
M. D. Hanlon	Axeman and office assistant	2 00 per day	....	6 00	6 00
L. F. Hichman	Axeman and office assistant	2 00 per day	66 00	2 65	68 65
A. O. Hollenbeck	Axeman and office assistant	2 00 per day	122 00	4 53	126 53
A. W. Hollenbeck	Axeman and office assistant	2 00 per day	240 00	105 47	345 47
A. P. Hughes	Axeman and office assistant	2 00 per day	160 00	102 83	262 83
J. F. Jahn	Axeman and office assistant	2 00 per day	202 00	50 40	252 40
A. J. Keating	Axeman and office assistant	2 00 per day	242 00	15 23	257 23
J. L. Kehoe	Axeman and office assistant	2 00 per day	240 00	93 29	333 29
J. M. Kells	Axeman and office assistant	2 00 per day	240 00	28 55	268 55
T. J. Larkin	Axeman and office assistant	2 00 per day	158 00	61 00	219 00
I. C. Lefevre	Axeman and office assistant	2 00 per day	150 00	2 38	152 38
A. P. Lynch	Axeman and office assistant	2 00 per day	120 00	....	120 00
R. A. Lynch	Axeman and office assistant	2 00 per day	92 00	8 57	100 57
C. B. Magan	Axeman and office assistant	2 00 per day	174 00	15 45	189 45
R. J. Maloy	Axeman and office assistant	2 00 per day	168 00	....	168 00
J. H. Maloney	Axeman and office assistant	2 00 per day	240 00	18 24	258 24
D. B. Mattice	Axeman and office assistant	2 00 per day	158 00	....	158 00
F. J. Mealey	Axeman and office assistant	2 00 per day	120 00	4 35	124 35
J. H. McCabe	Axeman and office assistant	2 00 per day	242 00	14 96	256 96
E. A. McCullough	Axeman and office assistant	2 00 per day	120 00	9 36	129 36
G. J. McKenna	Axeman and office assistant	2 00 per day	222 00	97 64	319 64
F. E. Moore	Axeman and office assistant	2 00 per day	158 00	93 36	251 36
J. J. Mulhall	Axeman and office assistant	2 00 per day	122 00	5 44	127 44
H. Paddock	Axeman and office assistant	2 00 per day	240 00	....	240 00
C. C. Pulsifer	Axeman and office assistant	2 00 per day	214 00	24 30	238 30
Wm. Robinson	Axeman and office assistant	2 00 per day	130 00	62 22	192 22
W. J. Ryan	Axeman and office assistant	2 00 per day	246 00	9 74	255 74
G. H. Savarese	Axeman and office assistant	2 00 per day	242 00	....	242 00
F. R. Schneller	Axeman and office assistant	2 00 per day	240 00	19 68	259 68
C. B. Seib	Axeman and office assistant	2 00 per day	252 00	13 62	265 62
T. F. Smythe	Axeman and office assistant	2 00 per day	166 00	13 42	179 42
G. V. Sweet	Axeman and office assistant	2 00 per day	254 00	....	254 00
F. H. Thomas	Axeman and office assistant	2 00 per day	184 00	....	184 00
T. F. Tracey	Axeman and office assistant	2 00 per day	240 00	65 59	305 59
G. L. Van Hagan	Axeman and office assistant	2 00 per day	126 00	....	126 00
W. J. Van Hoesen	Axeman and office assistant	2 00 per day	184 00	....	184 00
J. A. Wallace	Axeman and office assistant	2 00 per day	246 00	82 00	328 00
O. A. Walrath	Axeman and office assistant	2 00 per day	....	27 89	27 89
A. J. Allen	Laborer	2 00 per day	120 00	20 00	140 00
J. K. Alverson	Laborer	2 00 per day	240 00	....	240 00
J. L. Banker	Laborer	2 00 per day	258 00	....	258 00
R. W. Bissell	Laborer	2 00 per day	198 00	4 90	202 90
J. Blute	Laborer	2 00 per day	174 00	53 13	227 13
F. Boeck	Laborer	2 00 per day	184 00	....	184 00
D. Buckley	Laborer	2 00 per day	54 00	....	54 00
R. A. Burdick	Laborer	2 00 per day	120 00	....	120 00
J. H. Byrnes	Laborer	2 00 per day	26 00	....	26 00
L. A. Casey	Laborer	2 00 per day	184 00	....	184 00
D. Caspar	Laborer	2 00 per day	178 00	....	178 00
T. D. Clancy	Laborer	2 00 per day	182 00	35 88	217 88
E. C. Claud	Laborer	2 00 per day	46 00	....	46 00
J. Clark	Laborer	2 00 per day	120 00	....	120 00
W. H. Colgan	Laborer	2 00 per day	174 00	....	174 00
L. E. Cole	Laborer	2 00 per day	176 00	....	176 00

Improvement of Public Highways — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. E. Collins	Laborer	$2 00 per day	$54 00	....	$54 00
L. E. Conklin	Laborer	2 00 per day	112 00	$19 17	131 17
J. M. Connelly	Laborer	2 00 per day	66 00	....	66 00
W. A. Conger	Laborer	2 00 per day	22 00	....	22 00
E. D. Conroy	Laborer	2 00 per day	182 00	....	182 00
Edward Cook	Laborer	2 00 per day	172 00	7 66	179 66
J. T. Davis	Laborer	2 00 per day	118 00	....	118 00
T. Derby	Laborer	2 00 per day	30 00	....	30 00
W. H. Dorsey	Laborer	2 00 per day	172 00	5 00	177 00
J. Donavan	Laborer	2 00 per day	178 00	1 62	179 62
M. Donohue	Laborer	2 00 per day	52 00	....	52 00
W. T. Doody	Laborer	2 00 per day	104 00	....	104 00
J. C. Duggan	Laborer	2 00 per day	130 00	13 65	143 65
B. Dunleavy	Laborer	2 00 per day	120 00	....	120 00
M. Eagan	Laborer	2 00 per day	174 00	....	174 00
E. A. Faille	Laborer	2 00 per day	106 00	....	106 00
P. F. Farnum	Laborer	2 00 per day	174 00	20 40	194 40
J. Fields	Laborer	2 00 per day	110 00	....	110 00
Christy Graham	Laborer	2 00 per day	174 00	....	174 00
Alex. Greenwald	Laborer	2 00 per day	108 00	....	108 00
T. W. Gibbons	Laborer	2 00 per day	266 00	....	266 00
M. Hagan	Laborer	2 00 per day	166 00	....	166 00
W. Harding	Laborer	2 00 per day	46 00	....	46 00
J. D. Hartnett	Laborer	2 00 per day	174 00	....	174 00
F. Haggerty	Laborer	2 00 per day	120 00	....	120 00
E. T. Hayes	Laborer	2 00 per day	104 00	....	104 00
W. Herbert	Laborer	2 00 per day	120 00	....	120 00
C. L. Hitt	Laborer	2 00 per day	242 00	....	242 00
C. Hussy	Laborer	2 00 per day	40 00	....	40 00
P. P. Kelly	Laborer	2 00 per day	186 00	1 62	187 62
J. P. Kivlen	Laborer	2 00 per day	174 00	....	174 00
G. J. Korwan	Laborer	2 00 per day	158 00	....	158 00
Geo. Lanahan	Laborer	2 00 per day	174 00	....	174 00
T. J. Lanahan	Laborer	2 00 per day	168 00	....	168 00
M. Lang	Laborer	2 00 per day	86 00	....	86 00
E. J. Latrs	Laborer	2 00 per day	120 00	....	120 00
D. Lockwood	Laborer	2 00 per day	174 00	....	174 00
J. Loughlin	Laborer	2 00 per day	198 00	2 39	200 39
E. A. Lovelock	Laborer	2 00 per day	136 00	....	136 00
E. P. Low	Laborer	2 00 per day	174 00	....	174 00
L. J. Ludwig	Laborer	2 00 per day	182 00	....	182 00
J. M. Macdonald	Laborer	2 00 per day	158 00	79 00	237 00
Henry MacFarlane	Laborer	2 00 per day	202 00	13 60	215 60
D. Markham	Laborer	2 00 per day	92 00	....	92 00
W. A. McDermott	Laborer	2 00 per day	206 00	6 2	212 26
T. P. McEvoy	Laborer	2 00 per day	174 00	79 00	253 00
J. McKenna	Laborer	2 00 per day	114 00	7 78	121 78
A. McMartin	Laborer	2 00 per day	240 00	....	240 00
D. J. Minahan	Laborer	2 00 per day	200 00	....	200 00
H. S. Moore, Jr	Laborer	2 00 per day	182 00	....	182 00
J. B. Murphy	Laborer	2 00 per day	182 00	....	182 00
T. Murphy	Laborer	2 00 per day	120 00	....	120 00
J. J. Mulligan	Laborer	2 00 per day	158 00	....	158 00
F. Neet	Laborer	2 00 per day	46 00	....	46 00
J. Ostrander	Laborer	2 00 per day	54 00	....	54 00
H. Owens	Laborer	2 00 per day	104 00	....	104 00
L. Paige	Laborer	2 00 per day	202 00	342 29	544 29
H. S. Parsons	Laborer	2 00 per day	128 00	3 95	131 95
T. Rattoone	Laborer	2 00 per day	184 00	....	184 00
W. Reilly	Laborer	2 00 per day	128 00	8 56	136 56
J. H. Roney	Laborer	2 00 per day	86 00	33 00	119 00
G. N. Rooker	Laborer	2 00 per day	46 00	....	46 00
J. J. Ryan	Laborer	2 00 per day	174 00	....	174 00
Henry Sager	Laborer	2 00 per day	200 00	....	200 00
J. H. Schram	Laborer	2 00 per day	124 00	....	124 00
A. J. Sherlock	Laborer	2 00 per day	172 00	....	172 00
R. H. Smith	Laborer	2 00 per day	270 00	....	270 00
W. E. Smyth	Laborer	2 00 per day	92 00	103 01	195 01
G. M. Steinert	Laborer	2 00 per day	132 00	....	132 00
T. Sullivan	Laborer	2 00 per day	120 00	....	120 00
D. Sweeney	Laborer	2 00 per day	194 00	....	194 00
Cuyler Ten Eyck	Laborer	2 00 per day	200 00	....	200 00
T. Tydemann	Laborer	2 00 per day	38 00	....	38 00

Improvement of Public Highways — (Concluded).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
L. Van Dyke	Laborer	$2 00 per day	$106 00		$106 00
J. S. Wallace	Laborer	2 00 per day	84 00		84 00
W. Walters	Laborer	2 00 per day	120 00		120 00
A. F. Wilson	Laborer	2 00 per day	178 00	$26 00	204 00
			$127,239 86	$16,594 02	$143,833 88
Incidental Expenses.					
Stationery and printing				$2,356 08	
Livery				9,897 75	
Fuel and light				247 84	
Postage				296 77	
Office rent				2,456 18	
Telephone and telegraph				1,802 24	
Miscellaneous				3,125 01	
					20,181 82
Total					$164,015 70

"Money System" Repairs of Highways.

Chapter 577, Laws of 1907.

From October 1, 1908, to February 17, 1909.

NAME.	Rank	Rate of compensation.	Services.	Travel.	Total.
Stephen Ryan	Special examiner of highways	$12 00 per day	$948 00	$730 14	$1,678 14
F. D. Lyon	Special examiner of highways	12 00 per day	492 00	199 11	691 11
C. F. Chamberlain	Supervisor of highways	5 00 per day	665 00	413 62	1,078 62
I. P. Cribb	Supervisor of highways	5 00 per day	600 00	367 59	967 59
Samuel Grennon	Supervisor of highways	5 00 per day	395 00	369 01	764 01
F. J. McGuire	Supervisor of highways	5 00 per day	600 00	494 92	1,094 92
B. M. Patton	Supervisor of highways	5 00 per day	600 00	449 21	1,049 21
C. B. Perry	Supervisor of highways	5 00 per day	600 00	388 47	988 47
Peter Seeber	Supervisor of highways	5 00 per day	600 00	338 90	938 90
J. C. Van Arsdale	Supervisor of highways	5 00 per day	600 00	369 37	969 37
John Gick	Auditor of highway accounts	4 00 per day	416 00	317 96	733 96
E. M. Howland	Auditor of highway accounts	4 00 per day	560 00	18 03	578 03
H. W. Cowlbeck	Stenographer	125 00 per month	200 90		200 90
Valentina Brother	Stenographer	100 00 per month	427 37		427 37
E. A. Crowl	Stenographer	100 00 per month	160 71		160 71
H. D. Franklin	Stenographer	100 00 per month	160 71		160 71
T. C. Sweet	Stenographer	83 33 per month	133 92		133 92
Lucy McCormack	Stenographer	60 00 per month	276 43		276 43
M. A. Bingham	Temporary stenographer	50 00 per month	16 12		16 12
Martina Devlin	Temporary stenographer	50 00 per month	49 94		49 94
Fred Buck	Inspector of highways	4 50 per day	522 00	276 75	798 75
John Gyer	Inspector of highways	4 50 per day	514 00	131 95	645 95
C. A. Hulbert	Inspector of highways	4 50 per day	553 00	79 41	632 91
W. G. Edgerton	Inspector of highways	4 00 per day	488 00	20 65	508 65
J. J. Craven	Axeman and office assistant	2 00 per day	280 00		280 00
J. J. Glynn	Axeman and office assistant	2 00 per day	86 00		86 00
T. F. Smythe	Axeman and office assistant	2 00 per day	82 00		82 00
Leon Corregan	Laborer	2 00 per day	120 00		120 00
Mary Brucker	Charwoman	1 00 per day	170 00		170 00
			$11,317 60	$4,965 09	$16,282 69
Incidental Expenses.					
Stationery and printing				$658 43	
Livery				316 00	
Fuel and light				25 60	
Postage				180 11	
Telephone and telegraph				1,439 29	
Miscellaneous				1,615 52	
					4,234 95
Total					$20,517 64

Bureau of Bridges.

Chapter 578, Laws of 1907; Chapter 466, Laws of 1908; Chapter 433, Laws of 1909.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Wm. R. Davis	Chief bridge designer	$325 00 per month	$504 24	....	$504 24
J. G. Peck	Assistant chief bridge designer	250 00 per month	48 65	....	48 65
F. E. Blake	Mechanical engineer	175 00 per month	114 98	....	114 98
C. P. Wiweke	Mechanical draftsman	90 00 per month	64 44	....	64 44
R. C. Bastress	Bridge designer	175 00 per month	203 77	....	203 77
G. M. Braune	Bridge designer	175 00 per month	37 50	....	37 50
C. N. Haggart	Bridge designer	175 00 per month	69 44	....	69 44
A. G. Hayden	Bridge designer	175 00 per month	5 16	....	5 16
A. H. Higley	Bridge designer	175 00 per month	16 94	....	16 94
Harold Levy	Bridge designer	175 00 per month	17 50	....	17 50
H. D. Miller	Bridge designer	175 00 per month	39 52	....	39 52
H. E. Brainard	Bridge designer	150 00 per month	69 64	....	69 64
C. H. Wood	Bridge designer	150 00 per month	50 00	....	50 00
J. C. Considine	Bridge designer	125 00 per month	12 10	....	12 10
E. E. Briggs	Junior bridge draftsman	100 00 per month	6 45	....	6 45
E. J. Doyle	Assistant engineer	6 00 per day	60 00	....	60 00
Total	....	....	$1,320 33	....	$1,320 33

Examination of Monuments and Maps.

Chapter 466, Laws of 1908; Chapter 433, Laws of 1909.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. P. Willis	Resident engineer	$2,400 per year	$515 26	$562 85	$1,078 11
P. W. O'Grady	Assistant engineer	6 00 per day	690 00	952 23	1,642 23
A. T. O'Leary	Assistant engineer	5 00 per day	130 00	....	130 00
H. J. Richardson	Rodman	4 00 per day	8 00	18 20	26 20
H. F. Eagan	Chainman	3 00 per day	309 00	....	309 00
G. E. Deutschbein	Chainman	2 50 per day	142 50	....	142 50
Jacob Rubin	Chainman	2 50 per day	92 50	....	92 50
R. C. Williams	Chainman	2 50 per day	37 50	....	37 50
J. W. Arey	Laborer	2 00 per day	120 00	....	120 00
C. Barker	Laborer	2 00 per day	142 00	....	142 00
H. C. Bird	Laborer	2 00 per day	34 00	....	34 00
E. C. Claud	Laborer	2 00 per day	96 00	....	96 00
Thos. Davison	Laborer	2 00 per day	48 00	....	48 00
Chas. Ferris	Laborer	2 00 per day	148 00	....	148 00
Tony Finch	Laborer	2 00 per day	148 00	....	148 00
Herbert Goodrow	Laborer	2 00 per day	52 00	....	52 00
Wm. Harding	Laborer	2 00 per day	96 00	....	96 00
J. Harrington	Laborer	2 00 per day	50 00	....	50 00
D. B. Kaye	Laborer	2 00 per day	162 00	....	162 00
C. W. Ladd	Laborer	2 00 per day	46 00	....	46 00
Henry Miller	Laborer	2 00 per day	20 00	....	20 00
M. Monohan	Laborer	2 00 per day	36 00	....	36 00
Frank Neff	Laborer	2 00 per day	96 00	....	96 00
S. C. Poriss	Laborer	2 00 per day	80 00	....	80 00
G. N. Rooker	Laborer	2 00 per day	96 00	....	96 00
			$3,394 76	$1,533 28	$4,928 04
	Incidental Expenses.				
Stationery and printing				$0 75	
Livery				1,467 75	
Postage				6 38	
Telephone and telegraph				19 73	
Miscellaneous				248 74	
					1,743 35
Total					$6,671 39

Surveys for State Court of Claims.

Chapter 578, Laws of 1907.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. A. O'Connor	First resident engineer	$2,700 per year	$228 87	$106 47	$335 34
R. E. Horton	Resident engineer	2,700 per year	15 00		15 00
Wm. A. Treadwell	Engineering draftsman	4 00 per day	40 00	28 98	68 98
S. W. Belding	Assistant engineer	6 00 per day	12 00	8 12	20 12
D. R. Lee	Assistant engineer	6 00 per day	132 00	156 30	288 30
Jas. H. Sturtevant	Assistant engineer	6 00 per day	12 00	18 36	30 36
H. T. Arnold	Leveler	5 00 per day	130 00		130 00
Louis Wachtel	Leveler	4 50 per day	13 50		13 50
Frank Roberts	Rodman	4 00 per day	136 00		136 00
E. W. Wendell	Rodman	4 00 per day	8 00		8 00
E. C. Niles	Chainman	3 00 per day	21 00		21 00
Jacob Gadlowits	Chainman	2 50 per day	42 50		42 50
C. A. Wilbur	Chainman	2 50 per day	5 00		5 00
M. W. Wohlgemuth	Chainman	2 50 per day	35 00		35 00
S. Y. MacGregor	Inspector of masonry	4 50 per day	40 50	44 62	85 12
Harry Bowen	Inspector of masonry	4 50 per day	13 50	47 50	61 00
W. E. L. Hunter	Inspector of masonry	4 50 per day	13 50		13 50
J. T. E. Davis	Laborer	2 00 per day	4 00		4 00
Wm. F. Doody	Laborer	2 00 per day	6 00		6 00
A. J. Sherlock	Laborer	2 00 per day	4 00		4 00
L. F. Cashman	Axeman and office assistant	2 00 per day	6 00		6 00
Guy V. Sweet	Axeman and office assistant	2 00 per day	4 00		4 00
			$922 37	$410 35	$1,332 72
Incidental Expenses.					
Stationery and printing				$0 15	
Livery				34 50	
Telephone and telegraph				2 50	
Miscellaneous				2 41	
					39 56
Total					$1,372 28

Mohawk Street Bridge, Waterford.

Chapter 265, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
P. W. O'Grady	Assistant engineer	$6 00 per day	$366 00	$49 21	$415 21
H. F. Eagan	Chainman	3 00 per day	219 00		219 00
			$585 00	$49 21	$634 21
Incidental Expenses.					
Postage				$1 25	
Telephone and telegraph				2 70	
Miscellaneous				32 22	
					36 17
Total					$670 38

Survey, Cayuga and Seneca Canal.

Chapter 433, Laws of 1909.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
L. S. Hulburd	Assistant engineer	$6 00 per day	$444 00	$259 10	$703 10
J. H. Sturdevant	Assistant engineer	6 00 per day	426 00	8 80	434 80
John McBride	Leveler	5 00 per day	25 00	8 10	33 10
E. A. Duschak	Leveler	4 50 per day	36 00		36 00
R. G. Pratt	Rodman	3 50 per day	196 00		196 00
J. M. Prior	Rodman	3 50 per day	91 00		91 00
J. J. Schworm	Rodman	3 50 per day	147 00	5 55	152 55
H. J. Staible	Rodman	3 50 per day	59 50		59 50
C. H. Adams	Chainman	3 00 per day	207 00	8 10	215 10
E. F. Morey	Chainman	2 50 per day	55 00		55 00
E. S. Overbaugh	Chainman	2 50 per day	120 00		120 00
Geo. Schaefer	Chainman	2 50 per day	5 00		5 00
H. J. Spellman	Chainman	2 50 per day	27 50		27 50
H. Kramer	Foreman of borings	4 50 per day	207 00	12 28	219 28
E. S. Sterling	Boatman	3 00 per day	90 00		90 00
E. C. Ansley	Laborer	2 00 per day	82 00		82 00
C. W. Avery	Laborer	2 00 per day	86 00		86 00
R. H. Byrnes	Laborer	2 00 per day	84 00		84 00
F. L. De Beukelaer	Laborer	2 00 per day	112 00		112 00
W. C. Emens	Laborer	2 00 per day	88 00		88 00
Henry Hefferman	Laborer	2 00 per day	138 00		138 00
D. C. McGill	Laborer	2 00 per day	132 00		132 00
L. E. Moyer	Laborer	2 00 per day	2 00		2 00
Mott Palmer	Laborer	2 00 per day	128 00		128 00
F. W. Pettit	Laborer	2 00 per day	52 00		52 00
J. W. Seaton	Laborer	2 00 per day	112 00		112 00
J. A. Smith	Laborer	2 00 per day	26 00		26 00
H. B. Taylor	Laborer	2 00 per day	94 00		94 00
			$3,272 00	$301 93	$3,573 93

Incidental Expenses.

Stationery and printing	$3 92	
Livery	38 00	
Postage	1 65	
Office rent	34 00	
Telephone and telegraph	55	
Miscellaneous	250 06	
		328 18
Total		$3,902 11

Topographic Survey.

Chapter 466, Laws of 1908; Chapter 433, Laws of 1909.

In Coöperation with United States Geological Survey.

T. M. Bannon	$200 97
D. S. Barry, Jr	129 00
A. D. Beach	60 25
William T. Beenfield	19 50
Gail Blanchard	36 00
Brown Bros	68 00
R. S. Burhans	78 75
R. H. Chapman	176 71
J. J. Conway	118 00
R. D. Cummin	293 90
Director U. S. Geological Survey	179 22
H. L. Dodge	262 00
E. M. Eastwood	111 87
L. C. Fletcher	898 39
S. P. Floore	50 00
O. J. Gill	63 00
M. L. Greenfield	75 00
F. M. Gurney	310 80
J. R. Haswell	396 00
E. J. Johnson	78 75
Edward Lull	26 77
S. G. Lunde	54 25
A. W. Mattson	47 50

Topographic Survey — (Continued).

C. P. McAllaster	$108	50
E. McCormick	22	00
Frank McCune	42	75
F. J. McMaugh	120	60
R. C. McKinney	629	29
A. F. McNair	334	00
Arthur Mitchell	48	00
E. D. Monroe	444	83
W. H. S. Morey	1,122	84
P. G. Nichols	82	50
E. S. Niles	109	00
F. B. Northrup	102	50
Albert O'Dell	21	00
I. W. Petit	356	50
Ira Quinby, Jr	92	17
N. N. Reid, Jr	112	50
John Sallsbury	105	00
J. R. Sammons	142	50
R. C. Seitz	322	54
H. S. Senseney	124	75
Perley Shampine	468	66
C. R. Short	24	00
C. K. P. Smith	208	00
William Smith	18	00
L. A. Stansfield	143	17
J. T. Stephens	424	44
J. M. Whitman, Jr	1,331	42
D. B. Wickham	184	00
W. D. Young	232	50
Total	$11,212	59

Hydrographic Survey.

Chapter 466, Laws of 1908; Chapter 433, Laws of 1909.

C. R. Adams	$556	17
C. E. Allen	43	39
Lester Allen	30	00
Nellie G. Baldwin	6	25
H. K. Barrows	18	00
Edward Conron	1	50
C. C. Covert	330	02
H. F. French	99	92
Ora A. Gates	24	00
F. M. Goff	36	00
Chris Hannan	2	66
J. V. Henry	22	80
W. G. Hoyt	115	99
W. A. James	166	71
Jos. La Rue	24	00
John McAstocker	30	00
Mrs. Wm. Morgan	5	07
John Nolan	40	00
D. L. Orcutt	36	00
Lester Sevaire	18	00
M. E. Skehan	20	00
Hugh L. Smith	30	00
C. A. Waitt	30	00
E. F. Weeks	57	98
D. M. Wood	110	15
Total	$1,874	61

SUMMARY.

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals.

1.	Erie canal, chapter 465, Laws of 1908	$8,012 38
2.	Champlain canal, chapter 465, Laws of 1908	3,987 62

Construction of Barge Canal.

3.	Head office account, chapter 147, Laws of 1903; chapter 143, Laws of 1905; chapter 172, Laws of 1907; chapter 195, Laws of 1909	286,624 58
4.	Erie canal, chapter 147, Laws of 1903; chapter 143, Laws of 1905; chapter 172, Laws of 1907; chapter 195, Laws of 1909	178,638 25
5.	Champlain canal, chapter 147, Laws of 1903; chapter 143, Laws of 1905; chapter 172, Laws of 1907; chapter 195, Laws of 1909	96,303 03

Improvement of Public Highways.

6.	Improvement of public highways, chapter 115, Laws of 1898	164,015 70
7.	Maintenance and repairs of improved public highways, chapter 115, Laws of 1898; chapter 468, Laws of 1906; chapter 686, Laws of 1906; chapter 170, Laws of 1907; chapter 229, Laws of 1908	27,974 80
8.	" Money system " repairs of highways, chapter 700, Laws of 1905; chapter 686, Laws of 1906; chapter 577, Laws of 1907	20,517 64

Bureau of Bridges.

9.	Bureau of bridges, chapter 686, Laws of 1906; chapter 578, Laws of 1907; chapter 466, Laws of 1908; chapter 433, Laws of 1909	1,320 33

Special Surveys.

10.	Examination of monuments and maps, chapter 729, Laws of 1904; chapter 686, Laws of 1906; chapter 466, Laws of 1908; chapter 433, Laws of 1909	6,671 39
11.	Surveys for State Court of Claims, chapter 686, Laws of 1906; chapter 578, Laws of 1907	1,372 28
12.	Mohawk street bridge, Waterford, chapter 265, Laws of 1908	670 38
13.	Survey, Cayuga and Seneca canal, chapter 433, Laws of 1909	3,902 11
14.	Topographic survey, chapter 686, Laws of 1906; chapter 466, Laws of 1908; chapter 433, Laws of 1909	11,212 59
15.	Hydrographic survey, chapter 686, Laws of 1906; chapter 466, Laws of 1908; chapter 433, Laws of 1909	1,874 61
	Total	$813,097 69

TABLE OF CONTRACTS COMPLETED ON THE EASTERN DIVISION DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1909.

Construction of Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Final payment.
M. Fitzgerald	Aug. 8, 1906	Contract No. 34, Erie canal — Highway bridge at Saratoga avenue, Waterford	$22,604 00	$22,449 00	$22,316 90

Improvement of Public Highways.

Chapter 115, Laws of 1898, and amendatory laws.
(Completed between October 1, 1908, and February 17, 1909.)

CONTRACTOR.	Date of contract.	Character of work.	Contract price.	Final payment.
Mansfield & Burton	Jan. 20, 1908	Craigville, under grade crossing road, No. 154-B, Orange county	$15,086 00	$16,192 00
James E. Martin	July 3, 1906	Poughkeepsie–Pleasant Valley road, No. 549, Dutchess county	*49,773 15	†65,439 29

* Exclusive of special agreements.
† Final payment pending.

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, FEBRUARY 17, 1909.

Improvement of Public Highways.

Chapter 115, Laws of 1898; chapter 468, Laws of 1906, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, plus special agreements.	Payments to February 17, 1909.
Robert Schafer	July 12, 1906	Lake Pleasant–Speculator road, No. 277, Hamilton county	$33,900 00	$25,814 20	$15,970 51
Shanley–Morrissey, Inc	Sept. 20, 1907	Sprakers–Rural Grove road, No. 304, Montgomery county	59,600 00	54,834 25	21,374 97
Shanley–Morrissey, Inc	Dec. 18, 1907	Canajoharie–Sprout Brook road, No. 345, Montgomery county	41,900 00	38,610 70	23,026 35
Central & Eastern Construction Co	Nov. 12, 1908	Sprakers–Rural Grove (section 2) road, No. 346, Montgomery county	18,100 00	15,722 60	....
Joseph Walker	Nov. 12, 1908	Canajoharie–Sharon Springs (section 2) road, No. 347, Montgomery county	29,350 00	25,278 25	....
Elmore & Hamilton Construction Co	Dec. 2, 1907	West Point–Cornwall road, No. 411, Orange county	225,000 00	187,635 00	1,373 31
DeGraff & Hogeboom	Nov. 17, 1908	Port Jervis–Sullivan county line (section 1) road, No. 412, Orange county	32,750 00	55,400 65	....
DeGraff & Hogeboom	Nov. 17, 1908	Hyland Mills–Monroe road, No. 413, Orange county	18,400 00	30,410 00	....
Morris Kantrowitz	Sept. 19, 1907	Saratoga–Gansevoort road, No. 442, Saratoga county	45,700 00	37,984 50	21,229 83
Spuyten Duyvil Construction Co.	Dec. 2, 1907	Old Forge–McKeever road, No. 462, Herkimer county	126,410 00	114,610 65	24,969 96
Bellew & Merritt	Dec. 3, 1908	Manheim Center–Salisbury road, No. 463, Herkimer county	56,200 00	61,734 75	....
Rockefeller Bros	Nov. 12, 1908	Salisbury Center–Stratford road, No. 464, Herkimer county	44,600 00	38,839 00	....
Thomas H. Karr	Nov. 12, 1908	Troy–Speigeltown road, No. 504, Rensselaer county	16,450 00	14,244 75	....
Rockefeller Bros	Nov. 12, 1906	Schodack Center–Nassau road, No. 536, Rensselaer county	51,100 00	49,895 05	....
Shanley–Morrissey, Inc	Jan. 30, 1908	Mayfield–Northville (section 2) road, No. 541, Fulton county	60,150 00	49,773 15	18,890 10
S. B. Van Wagenen	Nov. 17, 1908	Johnstown–Broadalbin (section 2) road, No. 543, Fulton county	49,850 00	41,679 90	....
Long Island Contracting & Supply Co	Nov. 12, 1908	Willets–East Williston–Westbury Pond road, No. 547, Nassau county	63 500 00	63,189 80	....
Shanley–Morrissey, Inc	Sept. 20, 1907	Carmel–Kent road, No. 570, Putnam county	55,650 00	64,137 67	44,141 98
Thomas H. Karr	Nov. 13, 1908	Spring Ave., Troy–Poestenkill road, No. 571, Rensselaer county	24,575 00	20,323 50	....
Harvey B. Sproul	Nov. 13, 1908	Towners Corners–County Line road, No. 585, Putnam county	45,200 00	36,840 75	....

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, FEBRUARY 17, 1909 — (Concluded).

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, plus special agreements.	Payments to February 17, 1909.
John Harrigan	Nov. 13, 1908	Troy-Schenectady (section 3) road, No. 604, Albany county	$40,500 00	$27,696 90	
John E. Consalus	Nov. 13, 1908	Wicopee-Beekman road, No. 627, Dutchess county	77,500 00	56,473 65	
Jos. Walker	Nov. 13, 1908	Pawling-Dover Town Line road, No. 612, Dutchess county	32,100 00	29,323 00	
Malloy & Davis	Nov. 13, 1908	Troy-Schenectady (section 4) road, No. 630, Albany county	24,900 00	19,330 75	
Jos. Walker	Nov. 13, 1908	Indian Fields-Dormansville road, No. 646, Albany county	46,800 00	32,851 75	
Jos. Walker	Nov. 13, 1908	Hudson-Hollowville road, No. 650, Columbia county	68,400 00	56,317 40	
W. B. Spellman	Nov. 13, 1908	Champlain-Perrys Mills road, No. 652, Clinton county	27,500 00	22,107,75	
J. K. Palmer	Nov. 27, 1907	Milford Center-Milford road, No. 674, Otsego county	75,800 00	71,067 88	$43,322 64
J. K. Palmer	Nov. 27, 1907	Otego-Oneonta road, No. 675, Otsego county	52,800 00	46,657 86	15,912 64
Delaware Construction Co.	Feb. 4, 1908	Edmonston-West Burlington-Kelsey Corners road, No. 677, Otsego county	43,900 00	42,815 39	20,677 46
John E. Consalus	Nov. 13, 1908	Monsey-Egypt Corners road, No. 690, Rockland county	46,800 00	28,474 70	
Spuyten Duyvil Construction Co.	Jan. 23, 1908	Malone-Ft. Covington (section 2) road, No. 702, Franklin county	53,900 00	43,229 00	16,848 72
John Harrigan	Nov. 21, 1908	Sidney-Unadilla road, No. 708, Otsego county	52,100 00	35,541 50	
John E. Consalus	Feb. 11, 1908	Greenville-Coxsackie (section 2) road, No. 719, Greene county	52,600 00	42,338 80	31,139 44
Putnam & Hare	Nov. 14, 1908	Whitehall-Ft. Ann Town Line road, No. 723, Washington county	46,000 00	31,609 40	
Shanley-Morrissey, Inc.	Nov. 14, 1908	North Creek-County Line road, No. 736, Warren county	37,500 00	26,104 60	
P. F. Herlihy	May 18, 1908	Taylor-Schroon Lake village road, No. 745, Essex county	60,200 00	53,757 35	4,100 45
John F. Creeden	Dec. 5, 1908	Delhi-Bloomville road, No. 747, Delaware county	77,100 00	66,027 40	
Santonini Construction Co.	May 18, 1908	Aiden Lair-Newcomb (section 2) road, No. 756, Essex county	71,400 00	85,361 15	42,859 44
Decicco Contracting Co.	Nov. 20, 1908	Ossining-Kitchawan road, No. 768, Westchester county	68,600 00	44,698 50	
Decicco Contracting Co.	Nov. 20, 1908	Amawalk-Woods Bridge road, No. 769, Westchester county	44,600 00	27,297 00	
Decicco Contracting Co	Nov. 20, 1908	Goldens Bridge-Turk Hill road, No. 770, Westchester county	42,300 00	26,882 50	
Malloy & Davis	Nov. 14, 1908	Richfield Springs-Schuyler Lake road, No. 784, Otsego county	43,400 00	31,430 90	
Malloy & Davis	Nov. 14, 1908	South Schenectady-Moriaville road, No. 788, Schenectady county	82,800 00	64,226 70	
Henry J. Mullen	Nov. 14, 1908	Huntington-Amityville road, No. 794, Suffolk county	125,300 00	87,376 10	
Bellew & Merritt	Nov. 20, 1908	Jeffersonville-Kenoza Lake-Fosterdale road, No. 795, Sullivan county	71,900 00	49,903 50	
Thomas O'Hearn	Nov. 14, 1908	Greenville-Coxsackie (section 1) road, No. 796, Greene county	50,700 00	36,825 35	

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, SEPTEMBER 30, 1909.

Construction of Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Payments to September 30, 1909.
Empire Engineering Corp'n..	April 18, 1905	Contract No. 1, Champlain canal — Hudson river, Northumberland to Fort Miller and Crocker's Reef to Fort Edward..........	$619,846 00	$580,423 57	$425,847 74
Ferguson Contracting Co....	April 3, 1905	Contract No. 2, Erie canal — Through Waterford to Contract No. 11..........	1,022,640 00	946,105 76	660,893 32
Sundstrom & Stratton......	April 4, 1905	Contract No. 3, Champlain canal — Fort Miller to Crocker's Reef..........	760,576 00	657,273 09	619,401 82
Groton Bridge Co..........	Aug. 10, 1906	Contract No. 7, Erie and Champlain canals — Bridges on Contracts Nos. 2 and 3..........	33,576 60	31,637 60	30,690 00
Pittsburg-Eastern Co.......	May 22, 1906	Contract No. 8, Erie canal — Dams and locks at Scotia, Rotterdam and Cranesville..........	1,518,382 00	1,515,626 42	587,304 00
Fort Orange Construction Co.	May 21, 1906	Contract No. 11, Erie canal — From Contract No. 2 to Mohawk river..........	1,671,385 00	1,354,864 00	649,692 00
Penn Bridge Co...........	Nov. 7, 1908	Contract No. 13, Erie canal — Bridges on Contract No. 18..........	12,303 50	10,170 20	....
Acme Engineering and Contracting Co.............	Sept. 10, 1907	Contract No. 14, Erie canal — Mohawk river, Crescent to Rexford Flats aqueduct; dams at Crescent and Mindenville; dams and locks at Vischer's Ferry, Canajoharie, Yosts and Fort Plain..........	2,875,570 00	2,964,988 80	1,231,348 00
Atlantic, Gulf & Pacific Co..	Aug. 9, 1906	Contract No. 15, Champlain canal — Whitehall to Comstock..........	1,380,760 00	1,463,161 15	841,528 00
United Construction Co.....	Dec. 20, 1906	Contract No. 16, Erie and Champlain canals — Bridges on Contracts Nos. 11, 25 and 27..........	70,719 00	69,076 95	4,842 00
The Scofield Co...........	Dec. 29, 1906	Contract No. 17, Erie canal — Dams and locks at Amsterdam and Tribes Hill..........	883,926 00	842,613 28	48,744 00
Alexander Murdoch†.......	Mar. 3, 1908		836,221 00	812,286 70	356,942 42
O'Brien & Hoolihan Contracting Co.............	Dec. 28, 1906	Contract No. 18, Erie canal — Mindenville to Castle creek..........	785,980 00	854,594 00	355,452 60
Houston Barnard..........	Aug. 20, 1909	Contract No. 20-A, Erie canal — Little Falls to Castle creek..........	499,000 00	490,592 00	....
S. Pearson & Son, Inc......	Aug. 2, 1909	Contract No. 20-B, Erie canal — Mohawk river, Mindenville to Canajoharie..........	848,540 00	933,194 00	72 00
American Pipe and Construction Co................	Aug. 19, 1909	Contract No. 20-C, Erie canal — Mohawk river, Canajoharie to Yosts..........	570,600 00	585,720 00	....

† Contract relet.

TABLE OF CONTRACTS PENDING ON THE EASTERN DIVISION, SEPTEMBER 30, 1909 — (Concluded).

Construction of Barge Canal — (Concluded).

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Payments to September 30, 1909.
American Pipe and Construction Co	Aug. 18, 1909	Contract No. 20-D, Erie canal — Mohawk river, Yosts to Rexford Flats	$2,260,000 00	$2,681,040 40	....
Atlantic, Gulf & Pacific Co.	Nov. 19, 1906	Contract No. 25, Champlain canal — Comstock to Dunhams Basin	1,849,831 00	1,698,388 60	$801,766 00
Lake Erie Dredging Co	April 6, 1908	Contract No. 26, Champlain canal — Hudson river near Fort Edward	60,225 00	40,057 00	19,332 00
Kinser Construction Co	Nov. 23, 1906	Contract No. 27, Champlain canal — Dunhams Basin to Fort Edward	998,920 00	723,268 60	355,670 02
Maryland Dredging and Contracting Co	April 3, 1909	Contract No. 29, Erie canal — Sterling creek to Herkimer-Oneida county line	812,350 00	683,713 66	27,369 00
Acme Engineering and Contracting Co	July 16, 1909	Contract No. 30, Erie canal — Mohawk river, Little Falls to Sterling Creek	2,650,500 00	2,591,666 50	....
Casey & Murray	Sept. 2, 1908	Contract No. 31, Erie canal — Through Little Falls; Rocky Rift dam	813,800 00	829,305 78	256,096 27
Penn Bridge Co	April 19, 1909	Contract No. 32, Champlain canal — Lock-gates, etc., on Contracts Nos. 3, 25 and 27	59,820 00	46,797 00	....
Shanley-Morrissey, Inc	Nov. 23, 1908	Contract No. 68, Champlain canal — Locks at Mechanicville, Stillwater and Northumberland	1,175,623 00	1,018,323 00	294,696 00

REPORT

OF THE

DIVISION ENGINEER

OF THE

MIDDLE DIVISION

For the Fiscal Year Ended September 30, 1909

MIDDLE DIVISION

STATE OF NEW YORK,
DEPARTMENT OF STATE ENGINEER AND SURVEYOR,
MIDDLE DIVISION.
SYRACUSE, N. Y., *October* 1, 1909.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor, Albany, N. Y.:*

Sir.— I have the honor to submit herewith my annual report as Division Engineer, Middle Division, for the fiscal year ended September 30, 1909.

During the early part of the year the work comprised that pertaining to both the State canals and the improvement of public highways. This continued until February 17, 1909, when the two were separated and that pertaining to highways was formally turned over to the newly created Department of Highways.

The work of highway improvement was under the direct charge of Mr. F. W. Sarr, First Resident Engineer. For details of the men employed and the work done up to February 17, see accompanying tables.

Navigation on the Erie, Black River and Cayuga and Seneca canals has been uninterrupted throughout the season. The Oswego canal has been closed the entire season through the city of Fulton and was closed until July 15 through the city of Oswego. This was authorized by an act of the last Legislature and was for the purpose of progressing the work on Barge canal contracts Nos. 10 and 35, the former at Fulton and the latter at Oswego.

SPECIAL LEGISLATION.

CONSTRUCTING A PLATE GIRDER BRIDGE OVER CAZENOVIA LAKE OUTLET AT MILL STREET, CAZENOVIA.

(Chapter 281, Laws of 1908.)

Contractor, Montour Steel Company.

Engineer in charge, D. R. Lee.

Engineer's estimate at contract prices	$4,041 50
Final account	4,011 20

CONSTRUCTING A BRIDGE OVER THE CAYUGA AND SENECA CANAL AT OVID STREET IN THE VILLAGE OF SENECA FALLS.

(Chapter 273, Laws of 1908.)

Aside from making a survey and location map, no work has been done.

CONSTRUCTING A LIFT BRIDGE OVER THE ERIE CANAL AT SENECA STREET, UTICA.

(Chapter 454, Laws of 1909.)

Aside from making a survey and location map, no work has been done.

CONSTRUCTING A LIFT BRIDGE OVER THE OSWEGO CANAL AT SALINA STREET, SYRACUSE.

(Chapter 668, Laws of 1906.)

Contractor, John M. Shultz.

Engineer in charge, E. M. Ellis.

Engineer's estimate	$62,621 00
Engineer's estimate at contract prices	65,686 00
Final account	68,434 73

This bridge is of the Bascule type and since its final adjustment, it has worked well, notwithstanding its great skew of 56 degrees. Work on this structure was started in January, 1908, and completed in 1909.

CONSTRUCTING A PROTECTION WALL ON THE WEST SIDE OF SKANEATELES LAKE OUTLET.

(Chapter 675, Laws of 1906; Chapter 400, Laws of 1907; Chapter 394, Laws of 1908.)

Contractors, John Young and Patrick J. Cawley.

Engineer in charge, D. R. Lee.

Engineer's estimate	$9,122 00
Engineer's estimate at contract prices	11,893 00
Final account	11,444 60

This work was started in October, 1908, and completed in 1909.

CONSTRUCTING STAIRWAY FOR THE LIFT BRIDGE AT CATHARINE STREET, SYRACUSE, N. Y.

(Chapter 683, Laws of 1906.)

Contractor, John M. Shultz.

Engineer in charge, E. M. Ellis.

This structure was let for a lump sum of $1,500 for the work complete. It was started in June, 1908. A partial payment of $750 has been made. As the work has not been quite completed, no final account has been rendered.

IMPROVEMENT OF CAYUGA AND SENECA CANAL.

(Chapter 291, Laws of 1909.)

Work of making preliminary surveys under this act was started in June of this year. They are under the direct charge of Deputy State Engineer Harry W. DeGraff. Only the finances of the work have been cared for by the Division office.

COURT OF CLAIMS SURVEYS.

In addition to the usual requirements of the Superintendent of Public Works, in connection with ordinary repairs, considerable work has been done in making surveys and maps of private properties alleged to have been damaged by the State, and getting the data in condition for the Court of Claims.

WATER RECORDS OF CAYUGA AND CROSS LAKES AND SENECA RIVER.

In compliance with a concurrent resolution of the Legislature in 1884, water elevations at specified places have been taken and recorded three times yearly, viz.: During the first ten days of March, August and December.

The records have been taken at the prescribed times for 26 years, but in so doing a record of the extreme high water each year has not been obtained. Again, it is only when parts of the structures crossing the Seneca river are submerged that there is any difference in the elevation of the water surface above and below the structure. This submergence occurs only at times of high water, and then not every year. When it does occur, it is rarely on the prescribed dates.

The Barge canal route is through Cross lake and up the Seneca and Clyde rivers. Gages have been established and the readings recorded during the period of construction at both the old and new structures on the rivers. These records will be far more valuable than those obtained under the resolution. The taking of the latter will be but a partial and poor duplication and of no value. I would therefore recommend that the taking of the water records as prescribed by the resolution be discontinued.

WEIGH LOCK BUILDING AT SYRACUSE.

The division offices of the Middle Division of both the State Engineer's Department and the Superintendent of Public Works' Department are located in the Weigh Lock Building at Syracuse. The building was erected about 1850. It is of brick exterior and wood interior. It has no basement. The floor timbers of the first floor are more or less decayed. Their supports have settled to such an extent that the floors are out of level and the partition walls cracked and out of plumb.

The building is heated with steam obtained from an outside heating company. It is lighted by electricity, the wiring of which is in such shape that it would not pass an underwriter's inspection.

Stored in the division office are the records of the entire Middle Division, most of which are the originals. Should the building burn, these records would be irrevocably lost. I would therefore recommend that the Legislature be asked for an appropriation sufficient to make the building fire-proof throughout and to put a basement under it with a heating plant therein.

BARGE CANAL.

The Barge canal, as comprised in the Middle Division, extends from the east line of Oneida county to the east line of Wayne county, a distance, including Oneida lake, of about 97.4 miles. This is divided into three sections, viz., Nos. 5, 6 and 7. It also includes the Oswego branch extending from Three Rivers to Lake Ontario at Oswego, a distance of about 23 miles, and the territory covered by the Delta and Hinckley reservoirs in Oneida and Herkimer counties. The Oswego branch comprises one section.

Section No. 5 of the Erie Barge canal is in charge of Resident Engineer Edwin Styring, with headquarters at Rome, N. Y.

Section No. 6 and section No. 7 of the Erie Barge canal are in charge of First Resident Engineer Fred J. Wagner, with headquarters at Syracuse, N. Y. The Oswego Barge canal is in charge of Resident Engineer Theron M. Ripley, with headquarters at Fulton, N. Y. The water-supply residency — Delta and Hinckley reservoirs — is in charge of Resident Engineer L. C. Hulburd, with headquarters at Rome, N. Y.

ERIE CANAL, RESIDENCY No. 5.

Resident Engineer Edward Styring reports:

"This residency extends from the Herkimer-Oneida county line on the east to the Oneida-Onondaga county line in Oneida lake on the west, having a total length of about 38 miles, 7½ miles of which is in Oneida lake. The following contracts are located within this residency, in order from the east: Nos. 42, 43, 44, 4, 4a and 7, the last two being minor contracts connected with No. 4.

"*Contract No.* 42 extends from the Herkimer-Oneida county line to Oriskany road, a distance of 8.96 miles. Main features: Outside of lock No. 20, five bridges and a few smaller structures, a heavy excavation contract; let to Shanley-Morrissey, Inc., July 9, 1909, for $1,163,625; engineer's estimate, $1,312,814. Work, consisting of clearing, grubbing and excavating in the canal prism and building embankments, was commenced in the latter part of July at the west end of the contract. The plant employed in this work consists of three New Era graders, 36 wagons and slip scrapers, 68 head of mules, plows and rollers. In the latter part of September work was commenced just east of Schuyler St. with two large Lidgerwood excavators and a small steam-shovel. Other excavators are in the course of erection and a 12-inch hydraulic dredge is soon to commence operations in the new channel for the river at the west end of the contract. The probabilities are that no great amount of work will be done on this contract before next spring.

"The following table gives the summary of work done during the year and the total completed to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing..........acres	28	7.7	7.7	27.5	27.5
Grubbing..........cu. yds.	37,400	6,929	6,929	18.5	18.5
Excavation..........cu. yds.	2,786,300	59,420	59,420	2.1	2.1
Sheeting and bracing..........ft. B. M.	250,000	0	0	0.0	0.0
Forming embankment..........cu. yds.	646,800	41,650	41,650	6.5	6.5

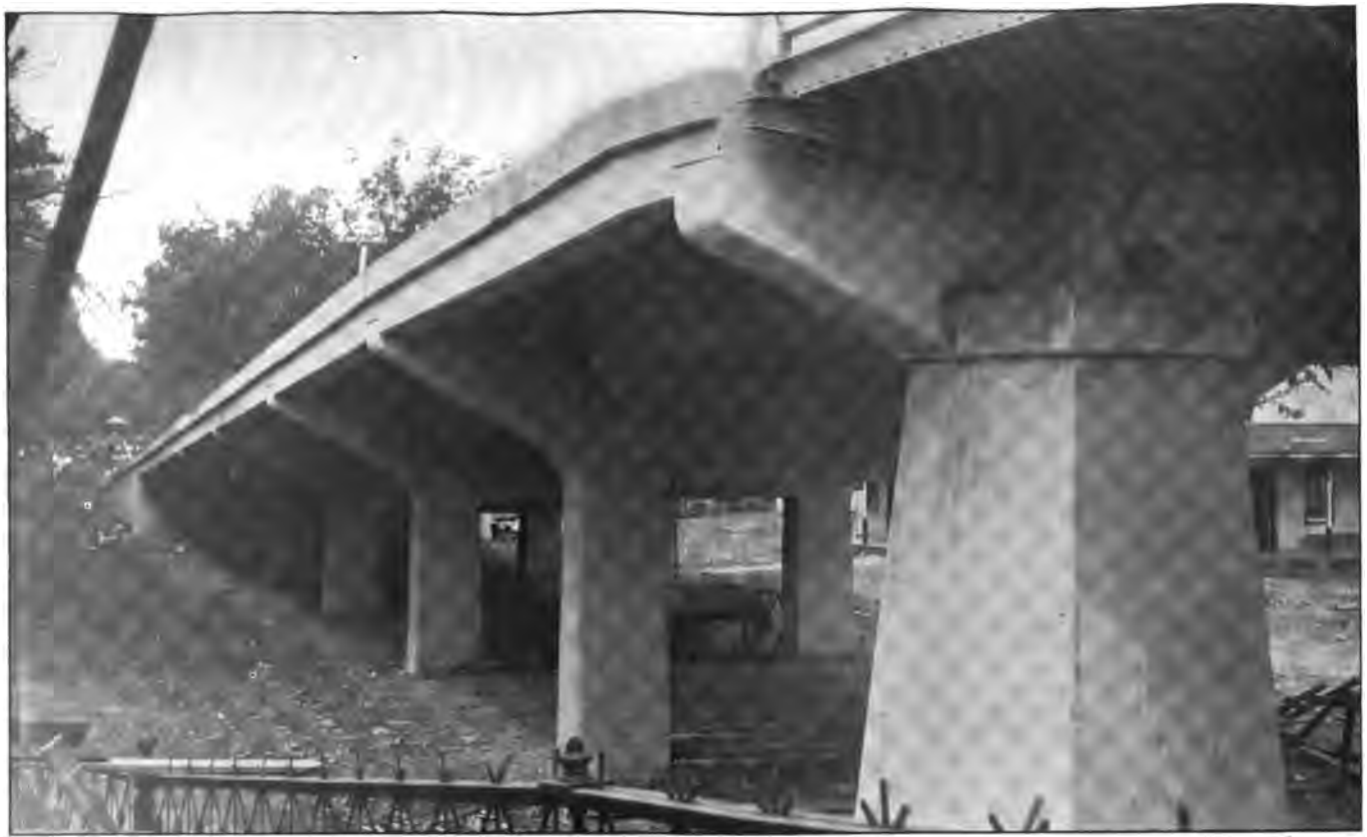
No items worked on other than the above.
Total of all work done during year = 1.5 per cent of estimated cost.
Total of all work done to date = 1.5 per cent of estimated cost.

"*Contract No.* 43 extends from Oriskany road on the east to about 1,500 feet west of Mud creek, a distance of 10.32 miles. Features: This is mostly a large excavation contract and will probably be done by hydraulic dredges. Several important structures, a junction lock, dam and guard-gate, and others, occur where the contract touches Rome, and difficult stretches of work occur in that vicinity, owing to the railroad crossings, three in number, and the Erie canal and street crossings. This contract, being on the summit level of the canal, includes structures for feeder entrances at the Mohawk river at Rome and Nine Mile creek, streams flowing from the new reservoirs to be built at Delta and Hinckley. Contract No. 43 is not yet let. Bids for the work are to be opened October 5.

"*Contract No.* 44 extends from the end of contract No. 43, on the east (Sta. 6320), to the beginning of contract No. 4 (Sta. 6694), a distance of 7.08 miles. Features: This is a heavy excavation contract and also contains two locks, Nos. 21 and 22, of 25 feet lift each, and a junction lock at New London. The line of the contract is almost entirely located in the wild and swampy lands lying between Rome and Sylvan Beach. The plans of this contract are before the Canal Board.

"*Contract No.* 4. This contract was one of the first let on the Barge canal. Let originally to Lindon W. Bates, April 18, 1905, it was assigned to the Empire Engineering Corporation on May 21, 1905.

"Contract No. 4 has been changed greatly since the original letting — in three alterations, briefly stated as follows: No. 1, re-



Barge Canal, Contract No. 4.
View of concrete approach at Sylvan Beach bridge.

lating to changes in the bridges, due to unforeseen conditions in the water-surface of Oneida lake; No. 2, a sweeping alteration, making a change in center line, side slopes, elimination of railroad crossing, timber revetment and incidental changes. No. 3 is a change in the center line for 3,300 feet at the east end of the contract, due to a relocation of the line of canal east of contract No. 4.

"This contract was let for $726,815, the engineer's estimate being $812,560, the successive alterations bringing it to $729,568. By agreement between the State and the New York, Ontario & Western Railway Company, whereby the latter performed the entire work of the railroad changes for a contract price of $118,161, a large item was removed from contract No. 4.

"Since the contract was let, work has progressed on it with varying success. A record of the percentage completed each year is as follows:

At the end of fiscal year 1906 — between 9 and 10 per cent.
At the end of fiscal year 1907 — 24 per cent.
At the end of fiscal year 1908 — 55 per cent.
At the end of fiscal year 1909 — 88 per cent.

"The contract may reach completion before the winter of 1910 sets in, and if not, then early in the spring of 1910. The structures will be completed by November 1, 1909.

"During the year work was done on the following structures: New north abutments of Roberts and Burdick bridges built; superstructures to Burdick, Roberts and Sylvan Beach bridges completed; wooden dam at Drum creek completed and concrete dam at Wood creek nearly completed; ditch entrances at Stas. 6807 and 6900 excavated and paved; finished placing cribs in breakwater and stone filling them; placed concrete top on the breakwater cribs to within a few yards of completion; over 800,000 yds. of excavation done.

"The following table shows the percentage of work done on the contract during the year, as well as the total percentage of work done. These percentages were determined after deducting the work done by the railroad company as above referred to:

ITEMS OF WORK.		Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing	lump sum	$1,000	0	$900	0	90
Grubbing	cu. yds.	2,800	0	2,421	0	86.5
All excavation	cu. yds.	2,977,521	813,225	2,526,211	27.4	84.9
Forming embankment	cu. yds.	154,905	13,812	74,017	8.5	47.5
Lining	cu. yds.	1,700	747	809	43.9	47.5
Yellow pine	ft. B. M.	300,000	117,021	280,000	59.5	93.5
White oak	ft. B. M.	10,000	3,072	7,034	30.7	70
Round timber	lin. ft.	565,000	153,791	533,783	7	94
Square sawed hemlock	ft. B. M.	412,000	226,448	473,460	52.5	112 5
Foundation piles, 12 ft. long	No.	1,908	0	1,966	0	103
Foundation piles, 20 ft. long	No.	256	0	174	0	68
Foundation piles, 35 ft. long	No.	88	30	86	34.4	98
Mooring piles, 30 ft. long	No.	14	0	6	0	43
Docking piles, 30 ft. long	No.	283	18	283	7	100
Sheet-piling	ft. B. M.	378,352	22,680	388,054	5.5	107.5
Steel and iron fastenings	lbs.	90,000	48,285	67,405	53.5	74.5
Second-class concrete	cu. yds.	10,058	7,230	8,568	72.5	85.5
First-class masonry coping	cu. yds.	9.14	3	5	33.2	55
Stone paving	sq. yds.	2,300	1,020	1,020	44.5	44.5
Stone filling	cu. yds.	48,000	30,027	50,168	62.5	104.5
Second-class riprap	cu. yds.	2,962	1,555	1,632	29	55
Fencing	lin. ft.	2,150	0	0	0	0
Maintaining traffic, Sylvan Beach bridge	lump sum	$6,000	$700	$6,000	12	100
First-class concrete	cu. yds.	1,250	15	1,278	1.5	102.5
Foundation piles, 25 ft. long	No.	132	28	132	20	100
Steel reinforcement	lbs.	139,100	9,325	137,125	7	99
Drain pipe	lbs.	800	0	800	0	100
Paved gutter	sq. yds.	104	99	103	95.2	99
Extra labor and forms	lump sum	$2,376	0	$2,376	0	100
Removing revetment	lin. ft.	6,965	502	7,252	7	104
Removing piles, 25 ft. and 30. ft. long	No.	42	39	39	93	93
Removing concrete	cu. yds.	280	0	264	0	94
Tie rods	No.	200	33	33	16.5	16.5
Overhaul on extra excavation	cu. yds.	611,043	209,465	611,043	34.3	100
Reinforced concrete	cu. yds.	89	89	89	100	100

Total of all work done during year - 33 per cent of estimated cost.
Total of all work done to date 88 per cent of estimated cost.

"*Contract No. 7.* Under this contract is embraced the superstructures of the three highway bridges on contract No. 4. These bridges are completed and the final estimate forwarded.

"*Engineering work.* During the year surveys have been made for the structures on contracts Nos. 42, 43 and 44. The base lines of these contracts and the right of way on contract No. 42 have been permanently monumented.

"Owing to soft material encountered for the foundation of lock 22, contract No. 44, further borings were made and test pits dug, resulting in a change of location for this lock to a point a little further west, where a hardpan foundation was obtained."

ERIE CANAL, RESIDENCIES NOS. 6 AND 7.

First Resident Engineer Fred J. Wagner reports:

"*Residency No.* 6.

"Residency No. 6 extends from deep water in Oneida lake to Baldwinsville, a distance, by the Barge canal line, of 23.4 miles. Contracts Nos. 45, 57, and a portion of Nos. 12 and 13 are within the limits of this residency.

"*Contract No.* 12 was let to The Stewart-Kerbaugh-Shanley Co. of New York city, on September 23, 1907. The total length of this contract is 43.73 miles, extending from deep water in Oneida lake to Mosquito Point bridge over the Seneca river, 22.5 miles being on Residency No. 6, and the remaining portion on Residency No. 7.

"The work accomplished during the past season has consisted mainly of excavation. Two ladder-dredges have been at work between deep water in Oneida lake and the first land cut below Brewerton. One hydraulic dredge has been at work at various points between the land cut at Brewerton and Oak Orchard and a Page excavator has been at work in the land cut just above Three River Point.

"At State Ditch, just below the outlet of Cross lake, a dipper-dredge has been at work. Up to the end of the fiscal year a total of 2,543,588 cu. yds. of material have been excavated at the several points along the line of the entire contract.

"The only masonry which has been built during the past year, besides completing that started during the year 1908, has been that of building bridge abutments at Sta. 3185 +. It is expected that work on this contract will progress much faster next season.

" The following table will show in detail the amount of the several classes of work done on this contract during the year:

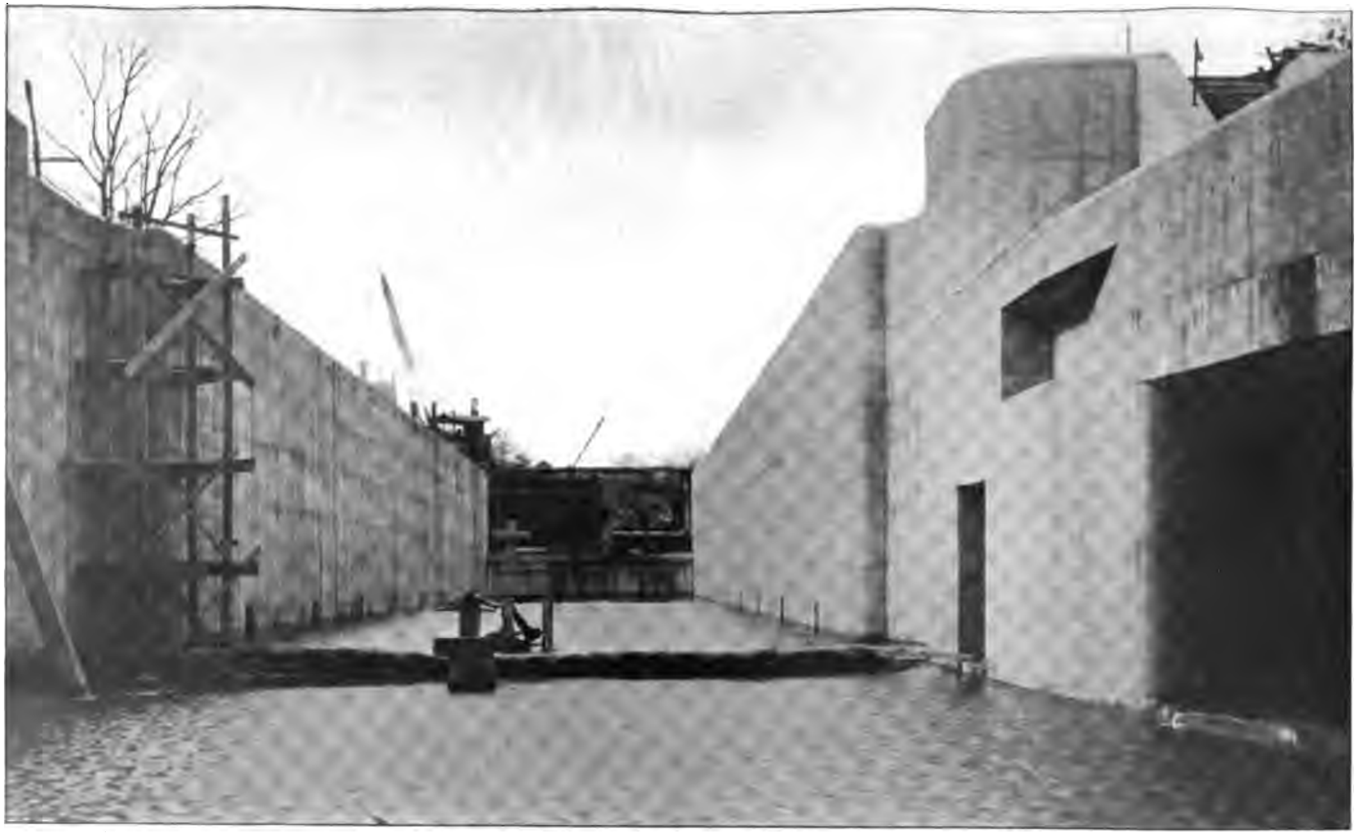
ITEMS OF WORK.	Preliminary estimate as affected by alterations 1 and 3.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing........................lump sum	$8,800	$1,742.40	$3,352.80	20	38.1
Grubbing........................cu. yds.	12,200	518	8,036	3	66
All excavation........................cu. yds.	7,692,170	1,446,879	2,043,588	19	26
Sheeting and bracing..............ft. B. M.	52,000	25,910	27,590	49	53
Forming embankment..............cu. yds.	127,150	17,572	18,540	14	15
Lining........................cu. yds.	1,330	490	490	37	37
Sawed lumber, yellow pine or Douglas fir........................ft. B. M.	689,900	34,375	36,500	4	5
Foundation piles, 12 ft. long..............No.	175	23	33	13	19
Foundation piles, 20 ft. long..............No.	180	29	71	16	39
Foundation piles, 25 ft. long*..............No.	....	16	16	100	....
Foundation piles, 30 ft. long*..............No.	....	1	1	100	....
Second-class concrete..............cu. yds.	28,880	917	1,045	3	4
Reinforced concrete†..............cu. yds.	510	346	793	67	155
First-class masonry bridge coping.....cu. yds.	10.00	5.46	5.46	55	55
Wash-wall........................cu. yds.	10,270	12	12	0.1	0.1
Cobble stone paving..............sq. yds.	120	30	30	25	25
Third-class riprap..............cu. yds.	230	103	103	45	45
Structural steel........................lbs.	665,200	336,056	556,114	55	83
Metal reinforcement........................lbs.	78,200	37,164	49,359	47	63
Raising bridge superstructure.......lump sum	$1,100	0	$1,100	0	100
Maintaining highway traffic........lump sum	$6,600	$2,257	$2,706	34.2	41
Gross estimate........................	$3,514,819	$604,430	$864,470	17	25

* Found necessary to use longer piles than called for in preliminary estimate.
† Changed from second-class to reinforced concrete by order of State Engineer.

" *Contract No.* 13 consists of building certain bridge superstructures over the Barge canal on contract No. 12. No work has been done on that portion of contract No. 13 which is within the limits of this residency.

" *Contract No.* 45, which is for the construction of a dam in the Oneida river at Caughdenoy and of lock No. 24 and appertaining structures at Baldwinsville, is only 0.55 mile in length and was let to Scott Bros., May 6, 1908.

" This work has progressed in fine shape during the past year and will probably be completed entirely during the coming winter. The masonry in the lock is entirely completed and the work at Caughdenoy is finished. Therefore, practically the only thing remaining to be done is installing lock-gates, valves, etc., and placing the machinery for automatic crest on Baldwinsville dam.



BARGE CANAL, CONTRACT NO. 45.
View of lock No. 24, at Baldwinsville.

"The following table will show in detail the amount of the several classes of work done on this contract during the year:

ITEMS OF WORK.	Preliminary estimate as affected by alterations 1, 2 and 3.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Grubbing.........................cu. yds.	570	64	512	11	89
Excavation.........................cu. yds.	334,300	151,327	221,024	46	66
Sheeting and bracing...............ft. B. M.	120,000	11,240	11,240	9	9
Forming embankment...............cu. yds.	54,830	25,708	25,708	47	47
Lining.........................cu. yds.	1,150	78	78	7	7
Sawed lumber, yellow pine or Douglas fir.... ....ft. B. M.	40,700	10,800	10,800	27	27
Sawed lumber in needles...........ft. B. M.	12	0	0	0	0
Sawed lumber, hemlock.............ft. B. M.	27.86	0	0	0	0
White oak lumber..................ft. B. M.	8.17	0	0	0	0
Round timber in cribs...............lin. ft.	320	0	0	0	0
Stone filling in cribs................cu. yds.	330	0	0	0	0
Foundation piles....................lin. ft.	3,700	0	1,272	0	34
Wooden sheet-piling................ft. B. M.	56,200	396	14,730	0.5	26
First-class concrete.................cu. yds.	6	3.46	3.46	58	58
Second-class concrete...............cu. yds.	31,586	26,935	28,954	85	92
Reinforced concrete.................cu. yds.	313	216.62	216.62	70	70
Bridge coping.........................cu. yds.	5	5	5	100	100
Wash-wall.........................cu. yds.	630	462	462	73	73
Third-class riprap..................cu. yds.	1,430	1,281	1,281	89	89
Fourth-class riprap.................cu. yds.	125	114	114	91	91
3½-in. cast iron pipe and specials.........lbs.	3,150	1,751	1,751	55	55
2½-in. cast iron pipe and specials.........lbs.	300	237.5	237.5	80	80
15-in vitrified pipe, laid...............lin. ft.	80	16	16	20	20
Structural steel.........................lbs.	285,580	267,090	267,090	93	93
Metal reinforcement....................lbs.	35,100	2,973	2,973	9	9
Steel castings.........................lbs.	13,780	7,800	7,800	6	6
Iron castings, plain.....................lbs.	3,230	0	0	0	0
Iron castings, machined..................lbs.	7,000	5,325	5,325	76	76
Portland cement sidewalks............sq. ft.	2,800	0	0	0	0
Stone curbs.........................lin. ft.	720	0	0	0	0
Cobble stone paving................sq. yds.	300	0	0	0	0
Wood paving.........................sq. yds.	330	0	0	0	0
Wrought iron chain.....................lbs.	850	0	0	0	0
Wrough iron pipe railing.............lin. ft.	1,500	847	847	56	56
Lattice railing.........................lin. ft.	180	180	180	100	100
Fender fastenings.....................each	580	412	412	71	71
Metal in lock-gate......................lbs.	195,000	11,355	11,355	0.6	0 6
Metal in buffer-beam....................lbs.	900,000	5,442	5,442	0.6	0.6
Metal in lock-valves....................lbs.	24,000	2,048	2,048	9	9
Metal in guard-gates....................lbs.	83,000	0	0	0	0
Metal in automatic dam.................lbs.	80,000	0	0	0	0
Coffer-dams, pumping, bailing and draining. ....lump sum	$32,600	$19,847	$22,820	61	70
Removing bridge superstructure....lump sum	$200	$200	$200	100	100
Maintaining highway traffic.........lump sum	$500	$250	$500	50	100
Brick pavement.....................sq. yds.	820	0	0	0	0
8" vitrified pipe.....................lin. ft.	60	0	0	0	0
Gross estimate..............................	$469,880	$294,380	$341,870	63	73

"*Contract No.* 57 is for the construction of a harbor at the south end of Onondaga lake. The preliminary work of making plans, etc., for this contract was completed during the early part of the present fiscal year. These plans are now in Albany, but are being held for further consideration.

"*Residency No.* 7

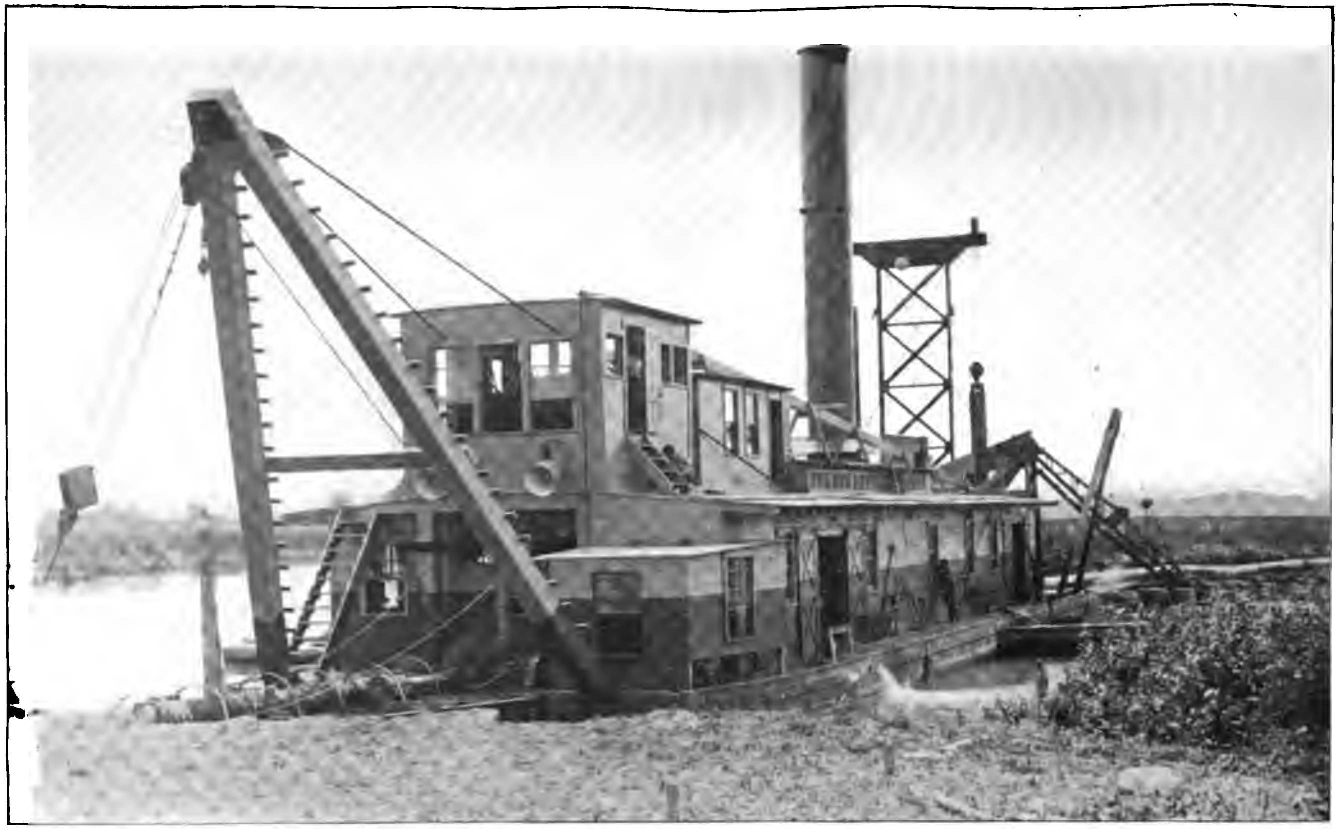
"Residency No. 7 extends from Baldwinsville to the Wayne county line, a distance of 32.7 miles by the Barge canal line. The contracts within the limits of this residency are Nos. 5, 46 and a portion of No. 12, which was described under the head of Residency No. 6.

"*Contract No.* 5, which was let to The Empire Engineering Corporation on April 18, 1905, was abandoned by the contractors early in the year of 1908, on account of the revision of the canal location at the west end of this contract, and a settlement by the Canal Board was made for that portion of the work completed. This revised line diverges from the original at Station 5202 + at Campbell's island and goes south of Crusoe island instead of across it, as called for in contract No. 5. The western end of contract No. 5 was embraced in contract No. 46.

"*Contract No.* 46 was let to The Kinser Construction Co. of Chicago, on November 23, 1908, and is for the construction of the canal from Fox Ridge to the southeast corner of the town of Galen, length 9.44 miles. During the winter of 1908–09 the contractors did some clearing and about the middle of June, 1909, a hydraulic dredge was placed at work in the river near the present Montezuma aqueduct and has been at work from this point westerly during the season, and up to October, 1909, had excavated a total of 896,099 cu. yds. of material. This dredge has a 20-inch discharge and during the month of September excavated 454,706 cu. yds., this being the best monthly record attained by a hydraulic dredge of this size on Barge canal work.

"The following table will show in detail the amount of the several classes of work done during the year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing . . . . lump sum	$5,000	$2,350	$3,250	47	47
Excavation . . . . cu. yds.	5,035,000	903,400	903,400	18	18
Gross estimate	$1,212,833	$155,920	$155,920	13	13



Barge Canal, Contract No. 46.

Hydraulic dredge at work. This dredge excavated 454,700 cubic yards of material during the month of September, 1909.

OSWEGO CANAL, RESIDENCY NO. 1.

Resident Engineer Theron M. Ripley reports:

"Residency No. 1 embraces the entire Oswego river from Three River Point to Lake Ontario, a distance of 23 miles.

"Preliminary work, so-called, is practically completed and the preliminary or residency party disbanded.

"There are three contracts in process of execution, viz., contract No. 10, at Fulton, contract No. 35, at Oswego, and contract No. 53, at Phoenix. The remaining work will be covered by the two major contracts, Nos. 37 and 39, the former being the remaining locks and dams and the latter all dredging required in the river. Aside from the above, there will be minor contracts for lock-gates, isolated dykes, bridges, etc. The amount of work under contract amounts to $1,983,438.24. The amount of work done to date equals $566,750.

"*Field Work.* From September 25, 1908, until early in February, 1909, a boring party was engaged in making Caylx, wash-drill and drive-rod borings and soundings along the river and its banks adjacent to the village of Minetto and just south of the city of Oswego, for the purpose of further study upon the location of locks and dams at Minetto and a new location for 'High Dam.'

"Topographic surveys of areas to be affected by the raising of Phoenix and Fulton dams have been made. Surveys have been made of spoils areas on contract No. 53 and for proposed borrow pits south of Fulton. The blue line has been established along the water front in Phoenix, Fulton and Minetto. The base line and blue line have been partially monumented.

"*Contract No.* 10 is for improving the Oswego canal for 1.2 miles along the river front of the city of Fulton. The work consists of the necessary excavation, the construction of two locks (gates and valves excepted) of 17.8 feet and 27 feet lift, respectively, the building of six sets of head-gates, and the raising of the two existing dams across the Oswego river. The work was let to Mosier & Summers of Buffalo, N. Y., in June, 1906. In April, 1909, the contract was assigned to the McDermott Contracting Company of Philadelphia, Pa. Owing to the difficulties encountered, progress on this contract has been extremely slow; it should have been completed July 9, 1909, but only 32 per cent of the work has been done.

"The following table gives the summary of work done during the year and the total completed to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing... ....lump sum	....	$100	$100	100	100
Grubbing.............. ....cu. yds.	3,390	116	1,284	3 4	37.9
Excavation........ ....cu. yds.	466,244	76,728	254,482	16.5	54.7
Sheeting and bracing..............ft. B. M.	100,000	22,900	80,400	22.9	80.4
Channeling.......... ....sq. ft.	45,300	6,660	11,714	14.7	26
Embankment....................cu. yds.	86,181	6,676	17,299	7.8	20
Lining..........................cu. yds.	2,000	652	652	32.5	32.5
Ballast..........................cu. yds.	2,252	0	7	0	0.3
First-class concrete...............cu. yds.	4,130	541	541	13.1	13.1
Second-class concrete..............cu. yds.	85,864	12,504	16,849	14.5	19.6
Wash-wall.......................cu. yds.	3,912	881	1,906	22.5	48.7
Second-class riprap...............cu. yds.	2,000	71	1,517	3.5	76
Second-class paving...............sq. yds.	830	0	46	0	5.5
Steel castings.......................lbs.	13,700	2,080	2,080	15.2	15.2
Iron castings, plain...................lbs.	269,900	40,905	40,905	15.1	15.1
Iron castings, machined...............lbs.	78,950	8,410	8,410	10.6	10.6
Structural steel.......................lbs.	217,603	22,153	44,627	10.2	20.5
Metal reinforcement................... lbs.	194,595	3,672	4,559	1.9	2.3
Gate hoists, heavy....................No.	5	1	3	20	60
Gate hoists, light.....................No.	22	2	7	9.1	31.8
Removing buildings..............lump sum Less value of buildings...........lump sum	....	$153	$1,377	10	90
Sheeting and bracing reused......M. ft. B. M.	....	2	2	....	....

Total of all work done during year - 14.5 per cent of estimated cost.
Total of all work done to date = 32.0 per cent of estimated cost.

"*Contract No.* 35 is for excavating the canal and protecting its sides; constructing lock Nos. 7 and 8 (of 14.5 feet and 11.1 feet lift, respectively) and other incidental work, for 0.85 mile south of the harbor line, which is north of Bridge street bridge, in the city of Oswego.

"This contract was awarded to the Gilmour-Horton-Allen Company September 16, 1907. The preliminary estimate was $752,760.00. The contract price, including alterations, was $699,069.45.

"Owing to the difficulties encountered, progress on this contract has been slow. Lock No. 8 has been completed, with the exception of the gates and buffer-beam, which will be placed during the coming winter.

" The following table gives the summary of work done during the year and the total completed to date:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation .... cu. yds.	187,000	29,620	44,020	15.9	23.5
Puddle .... cu. yds.	490	320	320	65.3	65.3
White oak in miter-sills and gates .... ft. B. M.	12,900	1,200	1,200	9.3	9.3
White oak sawed lumber .... ft. B. M.	41,000	7,784	7,784	19.1	19.3
Second-class concrete .... cu. yds.	50,625	15,235	17,274	30.1	34.3
Reinforced concrete .... cu. yds.	1,551	842	1,133	55.6	73.1
Fourth-class riprap .... cu. yds.	265	5	5	1.9	1.9
Wrought iron pipe, 4-in., and specials .... lbs.	6,960	5,936	5,936	85.3	85.3
Wrought iron pipe, 5-in., and specials .... lbs.	880	576	576	65.5	65.5
Pipe valves, 2-in .... No.	2	2	2	100	100
Pipe valves, 12-in., complete .... No.	2	2	2	100	100
Pipe valves, 20-in., complete .... No.	2	2	2	100	100
Structural steel .... lbs.	342,060	10,732	225,502	3.1	65.8
Metal in lock-gates .... lbs.	406,000	11,360	11,360	2.8	2.8
Metal in needle-dams .... lbs.	85,000	3,487	3,782	4.1	4.4
Metal reinforcement .... lbs.	215,300	78,570	123,069	36.5	57.5
Iron castings, plain .... lbs.	51,400	8,954	11,765	17.4	22.9
Iron castings, machined .... lbs.	17,300	7,909	7,909	45.6	45.6
Wood block pavement .... sq. yds.	500	439	439	100	100
Fender fastenings .... No.	972	209	293	21.5	30.1
Expansion bolts in place .... No.	115	55	55	47.8	47.8
Scroll railing .... lin. ft.	440	19	396	4.3	100
For removing old building superstructure .. lump sum	....	....	$75	....	75
For raising buildings .... lump sum	....	$500	$900	55.5	100

Total done during the year = 23.1 per cent of estimated cost.
Total done to date = 30 per cent of estimated cost.

" *Contract No.* 53 is for constructing lock No. 1, at Phoenix, on the Oswego canal.

" The work was awarded to Scott Brothers of Virginia, August 16, 1909. The preliminary estimate was $200,500. The contract price was $166,735.

" Work was started as soon as a plant could be assembled, and by September 30 a good showing had been made, as shown by the following table:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation .... cu. yds.	50,000	2,100	2,100	4	4

Total of all work done during year = 0.95 per cent.
Total of all work done to date = 0.95 per cent.
These percentages are based on value.

WATER-SUPPLY RESIDENCY.

Resident Engineer L. C. Hulburd reports:

"This residency comprises the work required in providing a water-supply for the Rome summit level. Four sources of supply have been considered, viz., the upper Mohawk river, Nine Mile creek, West Canada creek and Limestone creek. During the past year the work of this office has been confined to the first three sources. The construction required for these projects has been divided into three contracts, which division will be followed in the following report:

"*Contract No.* 50. For constructing dam, waste-gates and spillway across West Canada creek at Hinckley.

"Previous to October 1, 1908, topographical surveys and maps over the site of the proposed reservoir had been completed. Calyx and wash-drill borings had been made at the proposed location of the dam and the material further examined by means of test pits.

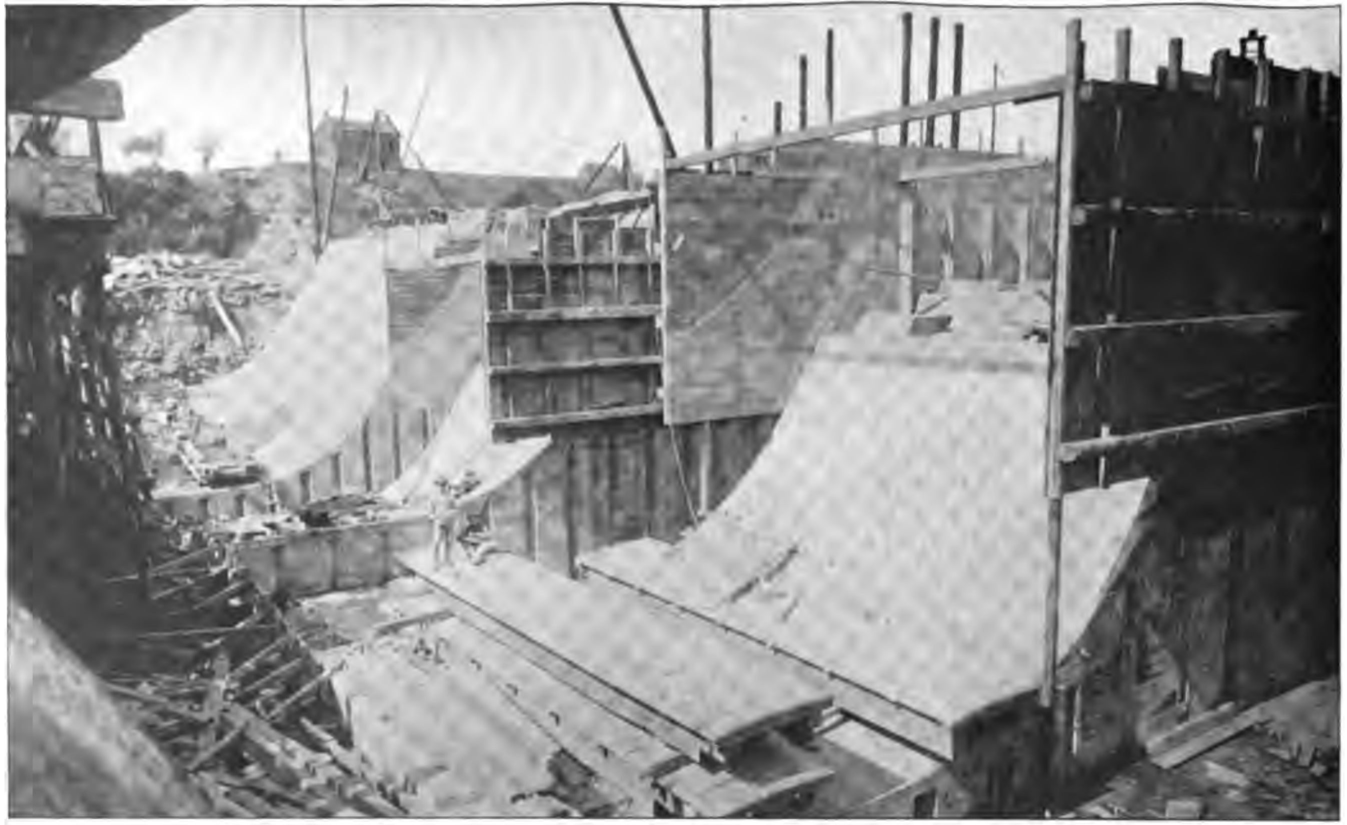
"During the past year a traverse, from which the flow line has been accurately located and mapped, has been completed and surveys over the boundary lines of property which will be flooded have been made. A large part of these surveys have been made through a country covered with brush and second growth, where property lines are not well defined and careful searching was required to determine their location. The total number of parcels surveyed during the year was 190, requiring 147 miles of traverse. These traverses are being computed and the property lines plotted.

"*Contract No.* 51. For constructing a diverting dam on West Canada creek and a feeder to Nine Mile creek watershed.

"Previous to October 1, 1908, topographical surveys and maps over the proposed location of feeder line had been completed, a location had been made on the ground and cross-sections taken.

"During the past year studies have been made for revising the location over a portion of the line; 3500 feet of wash-drill borings have been made, drive-rod soundings have been taken at one highway crossing; eight test pits dug for further examination of material at various points along the line and surveys made and maps prepared covering the property to be acquired for the proposed dam and feeder entrance.

"*Contract No.* 55. For constructing Delta reservoir, including the clearing of the site, the constructing of a dam, the relocation of



Barge Canal, Contract No. 55.

View showing progress in constructing the dam near Delta, for impounding the waters of the upper Mohawk to supply the Rome summit level of the Barge canal.

1.9 miles of Black River canal, with four locks and aqueduct over the Mohawk river, highway change, bridges, etc.

"There are 158 parcels of property to be acquired for the site of the reservoir constructed under this contract. These are distributed among 108 different owners and have required 145 separate appropriation maps. These maps have been completed and an index map made. In preparing the index map an attempt was made to plot the bounds of abutting property from deed descriptions, but such difficulties were encountered that a stadia survey was run around the reservoir and the corners of the forty-two adjacent properties located. The perimeter of the property acquired for this contract will be marked by 214 concrete monuments. On September 30, 185 of these monuments had been placed.

"The contract was awarded to Arthur McMullin on October 19, 1908. The site of the structures to be built is on the Black River canal five miles north of Rome. Shipment of plant was pushed forward rapidly and upon the close of navigation, November 30, sufficient plant had been assembled to permit the beginning of excavation for the foundation of the dam. This excavation and also that for the aqueduct foundation has been done with derricks. Generally, clam-shell buckets have been employed in excavating earth, and orange-peel buckets and scale boxes, loaded by hand, in removing the rock. Steam-drills have been used and the rock loosened with dynamite. All materials have been transported with the usual type of narrow gauge cars and small locomotives. The rock encountered is shale, similar to that found in several other portions of the Barge canal construction, quite readily quarried after light shooting. The rock surfaces, as uncovered, have corresponded very closely with that developed from borings and indicated on the contract drawings, except under pier No. 3 of the aqueduct, where an uneven surface was found dropping very rapidly to the north end with a segment of a pot hole at the south end.

"During the winter months two steam-shovels were transported across country from the railroad at Rome to the site of the work and the first of March excavation of the canal prism was begun with a 70-ton Bucyrus shovel. This excavation has progressed continuously, to date, in one eight-hour shift per day, exclusive of Sundays. Of the 185,000 cu. yds. of excavation in the canal prism about 109,600 cu. yds. are rock. This shovel has excavated both the rock and the earth without the use of explosives.

"With the opening of navigation a fleet of 32 boats, built to navigate the Black River canal, were put in service. These have been used in transporting concrete materials. Three of the boats were provided with hatches and used for cement. The remaining 29 were used for sand and stone.

"The large stone being used in the cyclopean masonry is obtained from the Sugar River quarry, located on the Black River canal near Boonville, about 23 miles from the dam site. The crushed stone is obtained from a new quarry located near the Black River canal, about 15 miles from the dam site. The sand comes from a pit at Frenchville, about five miles from the dam site. These have been operated and the towing done by the Boonville Company under a contract with Arthur McMullen.

"The concrete plant consists of a two-yard cubical mixer erected with measuring hopper and small storage bins above and transportation track underneath. Materials are placed in the storage bins by derricks and feed directly into the measuring hopper. The concrete is handled in two-cubic yard, bottom-dump buckets. The first concrete was placed on July 12. One pier and one abutment of the aqueduct have been completed and 15,186 cubic yards of masonry placed in the spillway of the dam. This consists of about 55 per cent second-class concrete and 45 per cent large stone.

"Clearing of the heavy timber on the site of the reservoir has been carried on by a small force throughout the year.

"The following table shows the progress of construction:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing . . . . . lump sum	100%	6%	6%	6.0	6.0
Grubbing . . . . . cu. yds.	6,600	3,370	3,370	51.1	51.1
Excavation . . . . . cu. yds.	346,000	158,947	158,947	45.9	45.9
Sheeting and bracing . . . . . ft. B. M.	20,000	8,335	8,335	41.6	41.6
Forming embankment . . . . . cu. yds.	160,600	47,769	47,769	29.7	29.7
Round timber bracing . . . . . lin. ft.	1,000	167	167	16.7	16.7
Second-class concrete . . . . . cu. yds.	19,100	1,874	1,874	9.8	9.8
Cyclopean masonry . . . . . cu. yds.	85,400	14,162	14,162	16.6	16.6
Metal reinforcement . . . . . lbs.	52,770	75	75	0.1	0.1
Drilling bolt holes in rock . . . . . lin. ft.	900	14	14	1.6	1.6
Coffer-dams, pumping, bailing and draining, lump sum	100%	2%	2%	2.0	2.0
Gross estimate	$920,137	$201,610	$201,610	21.0	21.9

IMPROVEMENT OF PUBLIC HIGHWAYS.

Since February 17 the work of highway improvement has been carried on under the new Department of Highways. The following pages contain a report of the roads completed between the end of the previous fiscal year, September 30, 1908, and the time when the transfer of authority was made:

CONTRACTS COMPLETED BETWEEN SEPTEMBER 30, 1908, AND FEBRUARY 17, 1909.

UTICA–ONEIDA CASTLE (SECTION 2) ROAD, NO. 271, ONEIDA COUNTY.

Length, 8.53 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $86,500.

Contract dated, September 15, 1906.

Work commenced, May 1, 1907.

Work completed, November 10, 1908.

Final account, $93,224.18.

Contractors, Casey and Murray.

Engineers in charge, W. W. Ewell and Louis Garbi, Jr.

This contract provides for the improvement of that section of the Seneca turnpike running from the hamlet of Lairdsville to the corporation line of Oneida Castle, with the exception of that portion lying in the incorporated village of Vernon, being a continuation of road No. 250. The macadam surface is 6 inches in depth.

On that portion of the road east of Vernon the macadam is formed all of local limestone and on that portion west of Vernon the bottom course is 3 inches in depth of local limestone and the top course 3 inches in depth of Little Falls syenite.

SENECA RIVER ROAD, NORTH SIDE, NO. 273, SENECA COUNTY.

Length, 1.30 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $17,850.

Contract dated, December 4, 1907.

Work commenced, May 25, 1908.

Work completed, October 21, 1908.

Final account, $15,180.43.

Contractors, Chambers and Grady.

Engineer in charge, A. L. Northrup.

This road extends from the corporation line of the village of Seneca Falls to the corporation line of the village of Waterloo, along the north side of the Seneca river. The macadam surface is 6 inches in thickness, all of local limestone.

UNION-MAINE ROAD, NO. 275, BROOME COUNTY.

Length, 3.04 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $31,500.

Contract dated, July 12, 1906.

Work commenced, July 16, 1907.

Work completed. November 10, 1908.

Final account, $30,160.32.

Contractor, County of Broome.

Engineers in charge, E. H. Stewart and B. J. Finch.

This road extends from the corporation line of the village of Union northerly on the road to Maine to the foot of the hill at Union Center. The macadam surface is 8 inches in depth, all of local fieldstone.

SYRACUSE-WATERTOWN ROAD, NO. 278, OSWEGO COUNTY.

Length, 2.41 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $26,950.

Contract dated, September 20, 1907.

Work commenced, July 6, 1908.

Work completed, November 7, 1908.

Final account, $23,217.76.

Contractor, Stewart-Kerbaugh-Shanley Company.

Engineer in charge, F. A. Gordon.

This road extends from the northerly end of the Oneida river bridge, at Brewerton, northerly to the corporation line of the village of Central Square. The macadam surface is 6 inches in depth, laid in two courses, the bottom course being 4 inches in depth of crushed local fieldstone and the top course 2 inches in depth of limestone from the Split Rock quarries at Syracuse.

WEST OSWEGO RIVER ROAD, NO. 279, OSWEGO COUNTY.

Length, 2.48 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $27,800.

Contract dated, September 20, 1907.

Work commenced, May 11, 1908.

Work completed, November 11, 1908.

Final account, $24,075.95.

Contractor, Stewart-Kerbaugh-Shanley Company.

Engineer in charge, S. A. Patterson.

This road extends from the city line of Oswego southerly on the west side of the Oswego river to the road extending to the station in the unincorporated village of Minetto. The macadam surface is 7 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of Morristown, New Jersey, trap-rock.

SKANEATELES–HAMILTON TURNPIKE (SECTION 1) ROAD, NO. 330, ONONDAGA COUNTY.

Length, 2.44 miles.

Width of macadam, 14 feet.

Engineer's preliminary estimate of total cost, including engineering, $28,500.

Contract dated, September 20, 1907.

Work commenced, April 20, 1908.

Work completed, December 5, 1908.

Final account, $23,995.34.

Contractor, Stewart-Kerbaugh-Shanley Company.

Engineer in charge, N. E. Young.

This contract provides for the improvement of the old Skaneateles-Hamilton turnpike extending from the four corners, about one mile west of Tully, through the hamlet of Vesper to the Otisco town line. The macadam surface is 6 inches in depth, all of local limestone.

CAYUGA HEIGHTS ROAD, NO. 336, TOMPKINS COUNTY.

Length, 3.17 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $37,400.

Contract dated, August 30, 1906.

Work commenced, October 15, 1906.

Work completed, November 12, 1908.

Final account, $32,147.45.

Contractor, County of Tompkins.

Engineers in charge, S. J. Stewart and W. H. Snyder.

This road extends from the city line of Ithaca northerly through the so-called Cayuga Heights, principally on a new location designed to obtain a more direct route into the city for that section of the town on the hill north of Ithaca and east of Cayuga lake. The macadam surface is 6 inches in depth, laid in two courses, the bottom course being 4 inches in depth of the harder grades of Ithaca shale, and the top course 2 inches in depth of imported limestone from the Blakeslee quarries.

SYRACUSE TURNPIKE ROAD, NO. 337, MADISON COUNTY.

Length, 1.58 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $13,800.

Contract dated, September 20, 1907.

Work commenced, September 1, 1908.

Work completed, December 16, 1908.

Final account, $12,104.92.

Contractor, Stewart-Kerbaugh-Shanley Company.

Engineer in charge, R. V. Collins.

This road extends from the road crossing at Cazenovia station northwesterly along the west shore of Cazenovia lake on the main road to Manlius and Syracuse to the top of the hill at the tunnel. The macadam surface is 6 inches in thickness, all of limestone from the Manlius quarries.

CATSKILL TURNPIKE (SECTION 2) ROAD, No. 338, TOMPKINS COUNTY.

Length, 1.38 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $14,900.

Contract dated, August 30, 1906.

Work commenced, October 2, 1906.

Work completed, October 10, 1906.

Final account, $13,279.75.

Contractor, County of Broome.

Engineers in charge, S. J. Stewart and W. H. Snyder.

This contract provides for the improvement of a portion of the main road extending from Ithaca to Slaterville, connecting roads Nos. 72 and 483. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in depth of crushed local fieldstone and the top course 2 inches in depth of imported limestone from the Blakeslee quarries.

GEORGETOWN ROAD, No. 339, MADISON COUNTY.

Length, 3.29 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, 31,400.

Contract dated, September 18, 1906.

Work commenced, June 3, 1907.

Work completed, November 12, 1908.

Final account, $27,395.74.

Contractor, Wm. I. Tyler.

Engineers in charge, T. F. Nichols and C. F. de Clercq.

This road extends from the railroad crossing at Georgetown station to and through the unincorporated village of Georgetown on the main road to the Otselic valley. The macadam surface is 6 inches in depth, all of imported limestone from the Manlius quarries.

AUGUSTA ROAD, AUGUSTA SECTION, No. 368, ONEIDA COUNTY.

Length, 3.38 miles.

Width of macadam, 14 feet.

Engineer's preliminary estimate of total cost, including engineering, $36,000.

Contract dated, November 23, 1906.

Work commenced, September 9, 1907.

Work completed, November 9, 1908.

Final account, $34,248.22.

Contractor, John H. Gordon.

Enngineers in charge, Geo. R. Winslow and W. W. Ewell.

This contract provides for the improvement of that portion of the main road from Vernon to Oriskany Falls, extending northerly from the four corners in the hamlet of Augusta to the Vernon town line. The macadam is 6 inches in depth, laid in two courses, the bottom course being 4 inches in depth of crushed local fieldstone and the top course 2 inches in depth of local limestone.

MAINE ROAD, NO. 374, BROOME COUNTY.

Length, 3.37 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $33,550.

Contract dated, July 12, 1906.

Work commenced, January, 1907.

Work completed, November 10, 1908.

Final account, $32,872.21.

Contractors, Hinman and Sproul.

Engineers in charge, R. J. Marcher and B. J. Finch.

This road is a continuation of road No. 275, extending from Union Center to the hamlet of Maine. The macadam surface is 8 inches in depth, all of crushed local fieldstone.

HARFORD ROAD, NO. 379, CORTLAND COUNTY.

Length, 0.91 mile.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $7,600.

Contract dated, September 19, 1906.

Work commenced, October 10, 1907.

Work completed, November 23, 1908.

Final account, $6,758.70.

Contractor, John Weber and Sons, Inc.

Engineer in charge, George Yavroumis.

This contract provides for the improvement of a short section of road through the unincorporated village of Harford. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of imported limestone from the Blakeslee quarries.

STATE ROAD, HOMER, NO. 380, CORTLAND COUNTY.

Length, 4.39 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $42,400.

Contract dated, November 14, 1906.

Work commenced, July 17, 1907.

Work completed, November 11, 1908.

Final account, $37,740.79.

Contractors, Mott and Kemper.

Engineers in charge, N. E. Young and C. J. Myers.

This road extends from the corporation line of the village of Homer northwesterly on the so-called Scott road to the Scott town line. The macadam surface is 6 inches in depth, laid in two courses, the bottom course being 4 inches in depth of crushed local fieldstone and the top course 2 inches in depth of imported limestone from the Syracuse quarries.

FLEMING ROAD, NO. 384, CAYUGA COUNTY.

Length, 3.17 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $31,960.

Contract dated, November 10, 1906.

Work commenced, June 17, 1907.

Work completed, October 28, 1908.

Final account, $28,135.07.

Contractors, The Scofield Company and M. F. Dollard.

Engineers in charge, O. M. Severson and F. W. Bristow.

This road extends from the Owasco creek bridge at the foot of Owasco lake westerly and southerly along the west shore of Owasco lake. The contractors on this road went into the hands of a receiver when the road was 51 per cent completed. After some delay the State Engineer readvertised the work of completing the contract and it was awarded to Michael F. Dollard, May 21, 1908, the amount of the contract being $13,579.80, which is within the amount available for the work remaining to be done. The macadam surface is 6 inches in thickness, all of local limestone.

VESTAL ROAD, NO. 420, BROOME COUNTY.

Length, 3.69 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $35,600.

Contract dated, July 12, 1906.

Work commenced, July 20, 1908.

Work completed, November 10, 1908.

Final account, $35,338.23.

Contractor, County of Broome.

Engineer in charge, B. J. Finch.

This road extends from the southerly end of the Susquehanna river bridge at Vestal southerly and westerly through the unincorporated village of Vestal to the Tioga county line. The macadam is 6 inches in thickness, laid in two courses, the bottom course being 3 inches in thickness of crushed local fieldstone and the top course 3 inches in thickness of Morristown, New Jersey, trap-rock.

CONKLIN ROAD, NO. 421, BROOME COUNTY.

Length, 7.83 miles.

Width of macadam, 14 feet.

Engineer's preliminary estimate of total cost, including engineering, $84,100.

Contract dated, December 2, 1907.

Work commenced, April 22, 1908.

Work completed, November 11, 1908.

Final account, $79,930.09.

Contractors, Casey and Murray.

Engineer in charge, T. D. Ringwood.

This road extends easterly from the city line of Binghamton, on the southerly side of the Susquehanna river, to and through the hamlet of Conkling. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of Morristown, New Jersey, trap-rock.

STATE (SECTION 2) ROAD, NO. 426, JEFFERSON COUNTY.

Length, 4.05 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $46,950.

Contract dated, March 23, 1908.

Work commenced, June 1, 1908.

Work completed, November 9, 1908.

Final account, $43,406.36.

Contractor, Wm. J. Semper.

Engineers in charge, J. N. Slater and C. W. Johnson.

This contract provides for the improvement of the road extending from the corporation line of the village of Adams to the creek bridge in the hamlet of Lorraine, with the exception of the one-mile section improved under road No. 186. The macadam surface is 6 inches in thickness, all of crushed local hardheads, consisting principally of granite and Adirondack gneiss.

WATERTOWN–CARTHAGE (SECTION 3) ROAD, NO. 428, JEFFERSON COUNTY.

Length, 4.88 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $34,400.

Contract dated, December 18, 1907.

Work commenced, May 15, 1908.

Work completed, November 14, 1908.

Final account, $30,431.84.

Contractor, Stewart-Kerbaugh-Shanley Company.

Engineer in charge, Frederick S. Strong.

This road extends from the corporation line of the village of Carthage westerly on the northerly side of Black river to the river bridge at DeFeriet's, being a continuation of road No. 487. The macadam surface is 6 inches in thickness, all of local limestone.

SKANEATELES-SPAFFORD ROAD, No. 431, ONONDAGA COUNTY.

Length, 2.50 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $27,700.

Contract dated, July 20, 1906.

Work commenced, November 8, 1906.

Work completed, November 12, 1908.

Final account, $26,773.37.

Contractor, J. Charles Dayton.

Engineers in charge, J. O. Burt and F. F. Miller.

This contract provides for the improvement of that portion of the Skaneateles East Lake road from the southerly end of road No. 292 to the top of the Gulf hill on the road to Spafford. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of imported limestone from the Borodino quarries.

AUGUSTA ROAD, LOWELL AND SPENCER SECTIONS, No. 438, ONEIDA COUNTY.

Length, 7.10 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $70,500.

Contract dated, August 29, 1906.

Work commenced, September 12, 1906.

Work completed, November 14, 1908.

Final account, $78,201.05.

Contractor, M. F. Dollard.

Engineers in charge, C. J. Myers and Louis Garbi, Jr.

This road extends from the outer city line of Rome southerly through the hamlet of Lowell to the Seneca turnpike north of Ver non Center. The macadam surface is 6 inches in thickness, all of imported limestone from the Munnsville and Oriskany Falls quarries. The macadam is reinforced with a gravel sub-base course ranging from 4 inches to 8 inches in depth.

LISLE–CENTER LISLE ROAD, No. 445, BROOME COUNTY.

Length, 2.70 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $35,250.

Contract dated, December 20, 1907.

Work commenced, April 27, 1908.

Work completed, November 30, 1908.

Final account, $30,898.27.

Contractor, Joseph McCormick.

Engineer in charge, R. B. Hoadley, Jr.

This road extends from the corporation line of the village of Lisle to the hamlet of Center Lisle. The macadam surface is 6 inches in thickness, constructed in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of Morristown, New Jersey, traprock.

WYCKOFF ROAD, No. 455, TOMPKINS COUNTY.

Length, 0.34 mile.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $4,500.

Contract dated, August 30, 1906.

Work commenced, November 27, 1907.

Work completed, November 12, 1908.

Final account, $3,543.15.

Contractor, County of Tompkins.

Engineer in charge, R. E. Swinney.

This road is a short spur extending from the Cayuga Heights road, No. 336, leading toward the Cornell University campus. The macadam surface is 6 inches in thickness, constructed in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of imported limestone from the Blakeslee quarries.

SKANEATELES WEST LAKE (SECTIONS 3, 4 AND 5) ROAD, NO. 486, ONONDAGA COUNTY.

Length, 3.37 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $37,000.

Contract dated, November 10, 1906.

Work commenced, April 9, 1907.

Work completed, November 12, 1908.

Final account, $31,237.43.

Contractor, John Young.

Engineers in charge, J. O. Burt and F. F. Miller.

This contract provides for the improvement of the balance of the road extending from the corporation line of the village of Skaneateles, on the west side of Skaneateles lake, to the hamlet of Mandana, except that portion covered by roads Nos. 48 and 293.

The macadam surface is 6 inches in thickness, constructed in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of limestone from quarries three miles south of Mandana.

ELBRIDGE ROAD, NO. 487, ONONDAGA COUNTY.

Length, 3.66 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $44,300.

Contract dated, November 10, 1906.

Work commenced, June 26, 1907.

Work completed, November 14, 1908.

Final account, $36,445.92.

Contractor, Daniel V. Brown.

Engineers in charge, Geo. H. Thomson and L. D. Brownell.

This road is in two sections, known as the Jordan Valley section and the Elbridge section. The Jordan Valley section extends from the corporation line of the village of Elbridge to the corporation line of the village of Jordan along the so-called creek road; the

Elbridge section extends westerly from the corporation line of the village of Elbridge, on the Genesee turnpike, to the Cayuga county line. The macadam surface is 6 inches in thickness, all of imported limestone from Syracuse quarries.

HOMER–TULLY (SECTION 1) ROAD, NO. 510, CORTLAND COUNTY.

Length, 4.17 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $29,366.

Contract dated, July 10, 1906.

Work commenced, August 5, 1907.

Work completed, November 24, 1908.

Final account, $24,275.70.

Contractor, John Weber and Sons, Inc.

Engineers in charge, C. J. Myers and E. A. Dahmen.

This road extends northerly from the corporation line of the village of Homer, on the east side of the valley, to the Preble town line. The macadam surface is 6 inches in thickness, constructed in two courses, the bottom course being 4 inches in thickness of imported limestone from Syracuse quarries.

UTICA–BRIDGEWATER ROAD, NO. 559, ONEIDA COUNTY.

Length, 9.09 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $103,000.

Contract dated, September 19, 1907.

Work commenced, April 15, 1908.

Work completed, November 20, 1908.

Final account, $93,839.51.

Contractors, Casey and Murray.

Engineer in charge, Frank C. Tolles.

This road extends from the southerly end of road No. 71, at the Paris-New Hartford town line, southerly through the villages of Clayville and Cassville to the corporation line of the village of Bridgewater, with the exception of that portion lying in the unincorporated village of Clayville. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of local limestone and the top course 2 inches in thickness of Little Falls syenite.

MOHAWK RIVER ROAD, ROME, NO. 560, ONEIDA COUNTY.

Length, 2.42 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $24,600.

Contract dated, September 19, 1907.

Work commenced, October 25, 1907.

Work completed, October 22, 1908.

Final account, $22,256.99.

Contractors, Casey and Murray.

Engineer in charge, O. M. Severson.

This road extends from the westerly end of road No. 295 through that portion of the city of Rome outside of the corporation tax district to the inner corporation line. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of Little Falls syenite.

ROME–NORTHWESTERN (SECTION 1) ROAD, NO. 561, ONEIDA COUNTY.

Length, 4.48 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $57,400.

Contract dated, January 29, 1908.

Work commenced, April 10, 1908.

Work completed, November 10, 1908.

Final account, $58,800.25.

Contractors Brown and Lowe.

Engineers in charge, T. F. Nichols and Louis Garbi, Jr.

The original plans for this road provided for the improvement of that portion of the Rome-Northwestern road extending from the outer line of the city of Rome northerly through the villages of Westernville and Northwestern to the Mohawk river bridge north of Northwestern. The southerly portion of this highway, however, traverses the valley which will be flooded by the Delta reservoir for the Barge canal. The plans were, therefore, revised, cutting out the improvement of this portion of the road. This contract, therefore, provides for the improvement of that portion of the highway north of the flow line of the proposed reservoir. The macadam surface is 6 inches in thickness, the bottom course being 3 inches in thickness of local limestone and the top course 3 inches in thickness of Little Falls syenite.

AUBURN–SENECA FALLS (SECTION 1) ROAD, NO. 590, CAYUGA COUNTY.

Length, 7.06 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $76,900.

Contract dated, November 10, 1906.

Work commenced, April 29, 1907.

Work completed, November 2, 1908.

Contractors, The Scofield Company and Fred T. Ley & Co.

Engineers in charge, E. C. Clark and L. M. Cowen.

The contract for the improvement of this road was awarded to the Scofield Company of Philadelphia, Pa., who started the work early in the season of 1907. On or about the first of October, 1907, the Scofield Company went into the hands of a receiver and the work closed down suddenly without any warning, leaving a large amount of macadam in an unfinished condition. After considerable delay this Department took charge of the work and expended $1,385.75 for the purchase of material and labor to complete into macadam the loose stone spread on the road and otherwise protect the same for the winter season. The receivers did not make any effort to take up and complete the work, the State Engineer, after due notice thereof, advertised and awarded to Fred T. Ley & Co., Inc., a contract for the completion of the work contemplated in the Scofield Company's contract. The macadam surface is 6 inches in thickness, all of local limestone.

MORAVIA–NILES ROAD, NO. 591, CAYUGA COUNTY.

Length, 10.85 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $89,800.

Contract dated, November 15, 1906.

Work commenced, April 8, 1907.

Work completed, November 17, 1908.

Final account, $82,156.99.

Contractor, Jeremiah T. Finch.

Engineers in charge, A. L. Northrup and P. J. Fitzgerald.

This road extends northerly from the corporation line of the village of Moravia on the so-called Niles road to the Onondaga county line. The macadam surface is 6 inches in thickness, all ot local limestone.

AUBURN–ELBRIDGE ROAD, NO. 592, CAYUGA COUNTY.

Length, 5.61 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $55,400.

Contract dated, September 18, 1906.

Work commenced, April 15, 1907.

Work completed, October 28, 1908.

Final account, $48,006.43.

Contractors, Chambers and Grady.

Engineers in charge, E. C. Clark and A. L. Sayer.

This road extends from the city line of Auburn easterly through the hamlet of Sennett to the Onondaga county line on the Genesee turnpike. The macadam surface is 6 inches in thickness, all of local limestone.

After the contract for the improvement of this road had been awarded, the town authorities and the New York Central Railroad Company arranged to eliminate a grade crossing on this road about one mile west of Sennett. The contract for the grade crossing elimination was awarded to another contractor.

NORWICH–SOUTH NEW BERLIN (SECTION 1) ROAD, NO. 596, CHENANGO COUNTY.

Length, 3.42 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $35,900.

Contract dated, September 20, 1907.

Work commenced, April 14, 1908.

Work completed, November 11, 1908.

Final account, $32,279.90.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineer in charge, E. H. Stewart.

This road extends easterly from the corporation line of the village of Norwich on the South New Berlin road to the New Berlin town line. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of imported limestone from Oriskany Falls.

NORWICH–KINGS SETTLEMENT ROAD, NO. 597, CHENANGO COUNTY.

Length, 3.55 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $36,550.

Contract dated, October 22, 1907.

Work commenced, April 2, 1908.

Work completed, November 7, 1908.

Final account, $32,462.05.

Contractor, Newport Construction Company.

Engineer in charge, H. W. Benkart.

This road extends from a junction of the Norwich-North Norwich road, No. 505, about three-quarters of a mile north of the corporation line of the village of Norwich, northeasterly on the road to King's Settlement. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of imported limestone from Oriskany Falls.

NORWICH–PRESTON ROAD, NO. 598, CHENANGO COUNTY.

Length, 5.09 miles.

Width of macadam, 10 and 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $59,700.

Contract dated, December 14, 1907.

Work commenced, May 11, 1908.

Work completed, November 11, 1908.

Final account, $52,598.05.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineers in charge, E. H. Stewart and T. F. Nichols.

This road extends from the corporation line of the village of Norwich westerly to the hamlet of Preston. The macadam surface is 8 inches in thickness of local field and quarried stone, which consists of the harder grades of Oneonta sandstone.

CAYUGA HEIGHTS–HANSHAW CORNERS ROAD, NO. 606, TOMPKINS COUNTY.

Length, 2.12 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $25,000.

Contract dated, September 20, 1907.

Work commenced, April 13, 1908.

Work completed, November 7, 1908.

Final account, $20,819.03.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineer in charge, R. E. Swinney.

This road extends northeasterly on a new location from a junction with road No. 336 to a junction with the road leading to the village of Aetna; thence easterly on said road to the four corners north of Forest Home. The bottom course is 4 inches in thickness of the better quality of the Ithaca shale and the top course 2 inches in thickness of imported limestone from the Blakeslee quarries.

TRUMANSBURG–ITHACA ROAD, NO. 616, TOMPKINS COUNTY.

Length, 8.66 miles.

Width of macadam, 14 feet.

Engineer's preliminary estimate of total cost, including engineering, $94,500.

Contract dated, September 20, 1907.

Work commenced, May 11, 1908.

Work completed, November 11, 1908.

Final account, $97,643.26.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineer in charge, J. B. Whipple.

This road extends northwesterly from the city line of Ithaca to the corporation line of the village of Trumansburg. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of crushed local fieldstone and the top course 2 inches in thickness of imported limestone from the LeRoy quarries.

GRANBY ROAD, NO. 653, OSWEGO COUNTY.

Length, 5.06 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $63,200.

Contract dated, December 18, 1907.

Work commenced, May 11, 1908.

Work completed, November 16, 1908.

Final account, $56,946.64.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineers in charge, E. M. Babcock and E. H. Scheutzow.

This contract provides for the improvement of two sections of road in the town of Granby, one section extending westerly from the Fulton city line to Bowens Corners, the other section extending southerly from the Fulton city line on the river road to Wilcox's Corners. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course on the Bowens Corners section being 4 inches in thickness of crushed local fieldstone and on the Wilcox's Corners section 4 inches in thickness of imported limestone. The top course on both sections is 2 inches in thickness of Little Falls syenite.

CHITTENANGO–ONEIDA (SECTION 2) ROAD, NO. 726, MADISON COUNTY.

Length, 7.53 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $89,250.

Contract dated, February 11, 1908.

Work commenced, April 14, 1908.

Work completed, December 16, 1908.

Final account, $77,723.81.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineers in charge, T. F. Nichols and J. F. Maher.

This road extends westerly from the corporation tax district of the city of Oneida, on Lenox avenue, to the Seneca turnpike; thence along the Seneca turnpike to the Sullivan town line; also including the continuation of Peterboro street in the village of Canastota from the corporation line of Canastota at the Seneca turnpike southerly to the Lincoln town line. The macadam surface is 6 inches in thickness, laid in two courses, the bottom course being 4 inches in thickness of imported limestone from several commercial quarries and the top course 2 inches in thickness of Little Falls syenite.

IMPROVEMENT OF PUBLIC HIGHWAYS.

Recapitulation of Work Done to February 17, 1909.

COUNTY.	Miles under contract during period ended February 17, 1909.	Miles of plans and estimates completed prior to September 30, 1908.	Miles of plans and estimates completed prior to February 17, 1909.	Miles of plans and estimates completed during period ended February 17, 1909.	Miles of surveys made during period ended February 17, 1909.	Miles of contracts completed prior to September 30, 1908.	Miles of contracts completed prior to February 17, 1909.	Miles of contracts completed during period ended February 17, 1909.
Broome	1.14	91.48	91.48	....	......	36.84	57.47	20.63
Cayuga	4.88	66.45	66.45	...	6.19	2.19	29.78	27.59
Chenango	6.12	101.01	115.39	14.38	1.00	25.69	37.75	12.06
Cortland	5.79	42.30	42.30	..	...	6.22	16.23	10.01
Jefferson	5.40	108.04	117.25	9.21	2.95	39.92	55.74	15.82
Lewis	....	12.64	17.13	4.49	......	......	......	....
Madison	....	29.49	31.88	2.39	......	2.18	14.58	12.40
Oneida	5.02	141.71	141.71	......	......	38.83	73.83	35.00
Onondaga	11.68	110.06	121.80	11.74	0.18	21.06	33.03	11.97
Oswego	5.35	40.58	55.07	14.49	..	9.63	19.58	9.95
St. Lawrence	5.12	75.71	82.00	6.29	25.19	......	......	......
Seneca	4.31	33.95	38.82	4.87	......	......	1.30	1.30
Tioga	....	16.65	13.65	....	......	......	......	......
Tompkins	5.23	43.03	43.03	....	......	5.53	21.20	15.67
Totals	60.04	910.10	977.96	67.86	35.51	188.09	360.49	172.40

IN CONCLUSION:

The Division Engineer desires to extend earnest thanks to the State Engineer and Surveyor, the Deputy and Special Deputy State Engineers, to the Resident Engineers, and to all subordinate officers and employes of his Department, for the courtesy, consideration and support in the discharge of his official duties.

Very respectfully submitted,

GUY MOULTON,

Division Engineer.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS EMPLOYED IN THE MIDDLE DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES, FOR THE FISCAL YEAR ENDED SEPTEMBER 30, 1909.

Ordinary Repairs — Erie Canal.

Chapter 465, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton	Division engineer	$300 per month	$725 00	$3 09	$728 09
Fred J. Wagner	First resident engineer	250 per month	250 00	9 09	259 09
Fred W. Sarr	First resident engineer	225 per month	537 50	8.16	545 66
D. E. Whitford	Assistant engineer	6 00 per day	624 00	....	624 00
David R. Lee	Assistant engineer	6 00 per day	303 00	8 13	311 13
L. D. Brownell	Assistant engineer	6 00 per day	252 00	31 30	283 30
R. R. Stuart	Assistant engineer	6 00 per day	156 00	....	156 00
Carl F. Hopstein	Draftsman	5 00 per day	135 00	....	135 00
W. S. Morris	Rodman	4 00 per day	600 00	16 58	616 58
Geo. C. Hannon	Rodman	4 00 per day	48 00	....	48 00
Grove V. Purchase	Chainman	2 50 per day	100 00	....	100 00
Henry L. Bassett	Financial clerk	5 00 per day	390 00	....	390 00
Frank J. Kennedy	Financial clerk	5 00 per day	305 00	....	305 00
Howard U. Lyon	Estimate clerk	150 per month	225 00	2 59	227 59
Harvey Wagner	Stenographer	100 per month	400 00	....	400 00
L. A. MacSweeney	Inspector	4 50 per day	31 50	....	31 50
J. K. Smith	Axeman	2 00 per day	20 00	....	20 00
R. E. Gallivan	Axeman	2 00 per day	6 00	....	6 00
John Connors	Laborer	2 00 per day	626 00	....	626 00
Rudolph Beigel	Laborer	2 00 per day	158 00	....	158 00
Clark H. Norton	Laborer	2 00 per day	310 00	....	310 00
F. B. Ostrander	Laborer	2 00 per day	160 00	....	160 00
L. W. Moulton	Laborer	2 00 per day	40 00	....	40 00
J. Holden Wilson	Laborer	2 00 per day	6 00	....	6 00
			$6,408 00	$78 94	$6,486 94
Incidental Expenses.					
Livery				$7 50	
Stationery and printing				130 26	
Fuel and light				272 92	
Postage				141 65	
Telephone and telegraph				313 29	
Miscellaneous				1,062 20	
					1,927 82
Total					$8,414 76

Ordinary Repairs — Cayuga and Seneca Canal.

Chapter 465, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton	Division engineer	$300 per month	$75 00	$3 06	$78 08
David R. Lee	Assistant engineer	6 00 per day	60 00	75 10	135 10
L. D. Brownell	Assistant engineer	6 00 per day	54 00		54 00
W. S. Saxton	Leveler	4 50 per day	40 50		40 50
Geo. C. Hannon	Rodman	4 00 per day	36 00		36 00
F. A. Gordon	Rodman	4 00 per day	24 00		24 00
Harry C. Smith	Chainman	3 00 per day	15 00		15 00
M. H. Boigeol	Chainman	2 50 per day	7 50		7 50
			$312 00	$78 16	$390 18
	Incidental Expenses.				
Livery				$21 50	
Miscellaneous				8 93	
					30 43
Total					$420 61

Ordinary Repairs — Black River Canal.

Chapter 465, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
L. D. Brownell	Assistant engineer	$6 00 per day	$156 00	$7 5	$163 56
	Incidental Expenses.				
Miscellaneous				$1 07	1 7
Total					$164 63

Construction of Barge Canal — Erie Canal.

Chapter 147, Laws of 1903.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton	Division engineer	$300 per month	$1,754 03	$290 38	$2,044 41
Henry B. Brewster	Division engineer	300 per month	438 70	73 42	512 12
Fred J. Wagner	First resident engineer	250 per month	2,440 00	371 30	2,811 30
L. C. Hulburd	Resident engineer	200 per month	1,761 29	216 69	2,077 98
W. H. Van Wie	Resident engineer	200 per month	644 51	115 39	759 90
Edwin Styring	Resident engineer	200 per month	400 00	41 41	441 41
Carl L. Bannister	Assistant engineer	6 00 per day	1,878 00	49 99	1,927 99
Chas. W. Costello	Assistant engineer	6 00 per day	1,702 00	778 32	2,480 32
George H. Briggs	Assistant engineer	5 00 per day	1,565 00	1,224 67	2,799 67
W. J. Durkan	Assistant engineer	5 00 per day	1,565 00	764 40	2,329 40
Daniel B. Donovan	Assistant engineer	6 00 per day	1,878 00	532 04	2,410 04
Louis A. Burns	Assistant engineer	6 00 per day	1,878 00	11 99	1,889 99
Chas. H. Rogers	Assistant engineer	6 00 per day	1,710 00	140 40	1,850 40
W. A. Lafler	Assistant engineer	6 00 per day	1,722 00	296 27	2,018 27
H. C. Smith	Assistant engineer	5 50 per day	1,648 50	144 78	1,793 28
Arthur G. Crysler	Assistant engineer	6 00 per day	1,878 00	643 65	2,521 65
G. W. Stickney	Assistant engineer	6 00 per day	558 00	2 40	560 40
P. F. McClellan	Assistant engineer	5 00 per day	295 00	97	295 97
D. C. Wedgeworth	Assistant engineer	6 00 per day	1,944 00	58 82	2,002 82
Waldo G. Wildes	Assistant engineer	6 00 per day	1,716 00	378 89	2,094 89

Construction of Barge Canal — Erie Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Edward M. Ellis	Assistant engineer	$6 00 per day	$1,445 00	$104 06	$1,549 06
J. G. Palmer	Assistant engineer	6 00 per day	1,025 00	254 45	1,279 45
R. R. Stuart	Assistant engineer	6 00 per day	786 00	40 44	826 44
David R. Lee	Assistant engineer	6 00 per day	90 00	85	90 85
L. D. Brownell	Assistant engineer	6 00 per day	42 00		42 00
Chas. Donohue	Leveler	4 50 per day	1,408 50	391 43	1,799 93
Arch M. Snow	Leveler	4 50 per day	1,408 50		1,408 50
H. W. Benkart	Leveler	4 50 per day	256 50		256 50
D. J. Levinson	Leveler	4 50 per day	1,408 50		1,408 50
E. J. Berry	Leveler	5 00 per day	1,785 00	51 83	1,836 83
Foster B. Crocker	Leveler	5 00 per day	1,501 50		1,501 50
G. C. Ingersoll	Leveler	4 50 per day	265 50	69	266 19
Vann R. Phillips	Leveler	4 50 per day	261 00		261 00
R. W. Cady	Leveler	4 50 per day	1,413 00		1,413 00
George Yavroumis	Leveler	4 50 per day	355 50		355 50
N. R. McLoud	Leveler	5 00 per day	1,565 00	63 75	1,628 75
J. B. Whipple	Leveler	4 50 per day	616 50		616 50
A. W. Smith	Leveler	5 00 per day	1,130 00	46 19	1,176 19
W. S. Saxton	Leveler	4 50 per day	949 50		949 50
John F. Greathead	Leveler	5 00 per day	655 00		655 00
M. D. Ewell	Leveler	4 50 per day	279 00		279 00
A. B. Caudebec	Leveler	4 50 per day	171 00		171 00
Irvin S. Badger	Rodman	3 50 per day	1,099 00		1,099 00
Reynold W. Smith	Rodman	3 50 per day	1,088 50		1,088 50
Palmer C. Gallup	Rodman	4 00 per day	1,167 50		1,167 50
Geo. H. Thomas	Rodman	4 00 per day	1,264 00	86 20	1,350 20
Jerry P. Lynch	Rodman	3 50 per day	157 50		157 50
Geo. C. Hanson	Rodman	4 00 per day	408 00	8 57	416 57
John A. Sloat	Rodman	3 50 per day	1,099 00		1,099 00
Arthur T. Madison	Rodman	3 50 per day	1,067 50		1,067 50
Irving H. Smallwood	Rodman	4 00 per day	1,312 00		1,312 00
W. S. Morris	Rodman	4 00 per day	344 00	49 08	393 08
A. B. Caudebec	Rodman	4 00 per day	732 50		732 50
J. F. Maher	Rodman	4 00 per day	624 00		624 00
P. H. Budd	Rodman	3 50 per day	535 50		535 50
F. A. Gordon	Rodman	4 00 per day	808 00		808 00
Seward D. Hendricks	Rodman	3 50 per day	346 50		346 50
G. A. Payne	Chainman	2 50 per day	717 50		717 50
Henry C. Little	Chainman	3 00 per day	493 00	38 90	531 90
P. K. Lighthall	Chainman	2 50 per day	570 00		570 00
Harry C. Smith	Chainman	3 00 per day	933 00		933 00
M. H. Boigeol	Chainman	2 50 per day	391 50		391 50
L. Kavanagh	Chainman	3 00 per day	474 00		474 00
F. M. Fuller	Chainman	2 50 per day	785 00		785 00
Grove V. Purchase	Chainman	2 50 per day	105 00		105 00
H. P. O'Bryan	Chainman	3 00 per day	807 00		807 00
Frank Lutz	Chainman	3 00 per day	783 00		783 00
Don A. Wilcox	Chainman	3 00 per day	684 00		684 00
J. C. Adams	Chainman	3 00 per day	273 00		273 00
John J. Gawkins	Chainman	2 50 per day	262 50		262 50
Howard U. Lyon	Estimate clerk	150 per month	75 00		75 00
Henry L. Bassett	Financial clerk	5 00 per day	515 00		515 00
Frank J. Kennedy	Financial clerk	5 00 per day	65 00		65 00
Harvey Wagner	Stenographer	100 per month	500 00		500 00
L. J. Mulhauser	Stenographer	83 33 per month	408 32		408 32
Albert G. Card	Draftsman	5 00 per day	1,409 00		1,409 00
R. M. Fraser	Draftsman	4 50 per day	1,322 00		1,322 00
Carl F. Hopstein	Draftsman	5 00 per day	1,320 00	191 24	1,511 24
R. K. Sheldon	Draftsman	5 00 per day	1,525 00	64 49	1,589 49
H. J. O'Neil	Draftsman	5 00 per day	1,559 00		1,559 00
Chas. G. Lamphere	Tracer	75 00 per month	350 81		350 81
C. H. Mattison	Inspector	4 50 per day	445 50	60 38	505 88
W. J. Kelly	Inspector	5 00 per day	978 00		978 00
S. M. Stuart	Inspector	5 00 per day	1,620 00		1,620 00
W. N. Dutcher	Inspector	4 00 per day	132 00		132 00
L. A. MacSweeney	Inspector	4 50 per day	45 00		45 00
Geo. F. Wilcox	Inspector	3 50 per day	133 00		133 00
H. W. Stoneburg	Foreman of borings	4 00 per day	466 00	250 21	716 21
M. V. McCoy	Foreman of borings	3 50 per day	24 50		24 50
W. H. Rundle	Boatman	3 00 per day	288 00		288 00
Oscar Svenson	Boatman	3 00 per day	939 00		939 00
James Keating	Boatman	3 00 per day	288 00		288 00
William Furman	Boatman	3 00 per day	237 00		237 00
James H. McCabe	Boatman	3 00 per day	237 00		237 00

Construction of Barge Canal — Erie Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
A. H. Withey	Boatman	$3 00 per day	$447 00		$447 00
Chas. Rogers	Boatman	3 00 per day	387 00		387 00
John J. Gawkins	Axeman	2 00 per day	416 00		416 00
G. L. Gollands	Axeman	2 00 per day	630 00		630 00
Geo. E. Sweeting	Axeman	2 00 per day	602 00		602 00
Ward T. Marriott	Axeman	2 00 per day	626 00		626 00
John J. Phalan	Axeman	2 00 per day	626 00		626 00
Howard W. Loftus	Axeman	2 00 per day	372 00		372 00
Fred W. Harvey	Axeman	2 00 per day	52 00		52 00
R. E. Gallivan	Axeman	2 00 per day	52 00		52 00
Frank Layburn	Axeman	2 00 per day	72 00		72 00
William Tanner	Laborer	2 00 per day	262 00		262 00
Warren E. Miles	Laborer	2 00 per day	260 00		260 00
Fred'k R. Simmonds	Laborer	2 00 per day	264 00		264 00
L. W. Moulton	Laborer	2 00 per day	72 00		72 00
Bert Forbes	Laborer	2 00 per day	190 00		190 00
Harry March	Laborer	2 00 per day	186 00		186 00
Carl L. Slocum	Laborer	2 00 per day	132 00		132 00
Michael McAndrews	Laborer	2 00 per day	176 00		176 00
O. D. Hollenbeck	Laborer	2 00 per day	122 00		122 00
F. B. Ostrander	Laborer	2 00 per day	204 00		204 00
Joseph Reh	Laborer	2 00 per day	414 00		414 00
Clinton S. Hunt	Laborer	2 00 per day	168 00		168 00
Wm. Farrier	Laborer	2 00 per day	406 00		406 00
Spencer B. Randall	Laborer	2 00 per day	420 00		420 00
William Bird	Laborer	2 00 per day	336 00		336 00
John Kelly	Laborer	2 00 per day	114 00		114 00
Joseph E. Quinn	Laborer	2 00 per day	174 00		174 00
George Grogan	Laborer	2 00 per day	558 00		558 00
James Ward	Laborer	2 00 per day	174 00		174 00
Donald Cameron	Laborer	2 00 per day	128 00		128 00
Clarence Phelps	Laborer	2 00 per day	300 00		300 00
D. J. McCarthy	Laborer	2 00 per day	174 00		174 00
Martin Malia	Laborer	2 00 per day	174 00		174 00
J. L. Curtin	Laborer	2 00 per day	104 00		104 00
T. E. Gaynor	Laborer	2 00 per day	104 00		104 00
Daniel Goodwin	Laborer	2 00 per day	104 00		104 00
Bernard Murphy	Laborer	2 00 per day	104 00		104 00
Joseph Deley	Laborer	2 00 per day	104 00		104 00
Chas. Deley	Laborer	2 00 per day	104 00		104 00
Elmer Filkins	Laborer	2 00 per day	104 00		104 00
Joseph Beck	Laborer	2 00 per day	104 00		104 00
J. H. Wilson	Laborer	2 00 per day	116 00		116 00
T. J. Aldcorn	Laborer	2 00 per day	296 00		296 00
Parson Derrick	Laborer	2 00 per day	42 00		42 00
Peter Kappesser	Laborer	2 00 per day	100 00		100 00
Bird D. Kneeland	Laborer	2 00 per day	30 00	$0 75	30 75
Sylvester Willse	Laborer	2 00 per day	30 00		30 00
Jas. Keating	Laborer	2 00 per day	434 00		434 00
M. C. Plunkett	Laborer	2 00 per day	30 00		30 00
John E. Smith	Laborer	2 00 per day	264 00		264 00
Frank O'Brien	Laborer	2 00 per day	30 00		30 00
James H. McCabe	Laborer	2 00 per day	174 00		174 00
Joseph F. O'Brien	Laborer	2 00 per day	448 00		448 00
Frank Douglass	Laborer	2 00 per day	174 00		174 00
W. J. Ryan	Laborer	2 00 per day	294 00		294 00
Clark H. Norton	Laborer	2 00 per day	106 00		106 00
John C. Fitzsimmons	Laborer	2 00 per day	178 00		178 00
John G. Nestle	Laborer	2 00 per day	16 00		16 00
Alfred White	Laborer	2 00 per day	70 00		70 00
A. J. Keller	Laborer	2 00 per day	192 00		192 00
James Smith	Laborer	2 00 per day	104 00		104 00
Chas. Knittle	Laborer	2 00 per day	176 00		176 00
W. H. Wright	Laborer	2 00 per day	62 00		62 00
Stanley Evenden	Laborer	2 00 per day	24 00		24 00
John Ienbeck	Laborer	2 00 per day	52 00		52 00
Marie Brandt	Gage reader	7 00 per month	84 00		84 00
Daniel Brown	Gage reader	7 00 per month	84 00		84 00
Chas. Bourke	Gage reader	5 00 per month	60 00		60 00
Frank Burns	Gage reader	5 00 per month	60 00		60 00
John Carroll	Gage reader	7 00 per month	84 00		84 00
John Chamberlain	Gage reader	5 00 per month	60 00		60 00
W. T. Crill	Gage reader	7 00 per month	84 00		84 00

Construction of Barge Canal — Erie Canal — (Concluded).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Geo. Covell	Gage reader	$5 00 per month	$10 00	....	$10 00
Geo. W. Graves	Gage reader	7 00 per month	10 84	....	10 84
W. Van Kirk	Gage reader	5 00 per month	5 00	....	5 00
W. B. Dempsey	Gage reader	7 00 per month	84 00	....	84 00
A. H. O'Reilly	Gage reader	7 00 per month	2 56	....	2 56
A. Dement	Gage reader	7 00 per month	2 56	....	2 56
E. A. Evans	Gage reader	5 00 per month	60 00	....	60 00
Adniram Hart	Gage reader	5 00 per month	60 00	....	60 00
Karl Hatch	Gage reader	7 00 per month	14 00	....	14 00
Albert Bain	Gage reader	5 00 per month	8 17	....	8 17
Griff G. Williams	Gage reader	7 00 per month	84 00	....	84 00
L. W. McHenry	Gage reader	7 00 per month	18 75	....	18 75
Bessie C. Kellogg	Gage reader	7 00 per month	51 25	....	51 25
H. T. Mason	Gage reader	7 00 per month	70 00	....	70 00
W. H. Dunn	Gage reader	5 00 per month	50 00	....	50 00
B. W. Hawley	Gage reader	10 00 per month	20 00	....	20 00
E. A. Hurlbut	Gage reader	7 00 per month	42 00	....	42 00
Chris. Hannon	Gage reader	4 00 per month	33 42	....	33 42
J. H. Rupert	Gage reader	5 00 per month	60 00	....	60 00
Frank Shane	Gage reader	5 00 per month	60 00	....	60 00
Melvin H. Smith	Gage reader	7 00 per month	35 00	....	35 00
W. Van Kirk	Gage reader	5 00 per month	5 00	....	5 00
Henry Straub	Gage reader	7 00 per month	84 00	....	84 00
Solomon Walts	Gage reader	7 00 per month	84 00	....	84 00
John P. Watts	Gage reader	5 00 per month	60 00	....	60 00
Luke McHenry	Gage reader	7 00 per month	14 00	....	14 00
F. V. Voorhees	Gage reader	10 00 per month	20 00	....	20 00
Chas. Brannock	Gage reader	10 00 per month	60 00	....	60 00
L. W. Moulton	Gage reader	5 00 per month	43 30	....	43 30
John Phillips	Gage reader	6 00 per month	72 00	....	72 00
Maria Powell	Gage reader	7 00 per month	84 00	....	84 00
William Prettie	Gage reader	5 00 per month	60 00	....	60 00
Mark Quimby	Gage reader	5 00 per month	60 00	....	60 00
Horace W. Haynes	Gage reader	10 00 per month	20 00	....	20 00
Robert H. Ogle	Gage reader	5 00 per month	10 83	....	10 83
Mrs. A. H. Hoffmeister	Gage reader	7 00 per month	84 00	....	84 00
W. M. Hubbard	Gage reader	5 00 per month	60 00	....	60 00
Ed Jones	Gage reader	5 00 per month	50 00	....	50 00
Mark Kennedy	Gage reader	5 00 per month	60 00	....	60 00
Louis McArthur	Gage reader	10 00 per month	120 00	....	120 00
			$98,720 34	$7,939 69	$106,660 03
	Incidental Expenses.				
Instruments and tools				$379 22	
Office rent				867 00	
Fuel and light				636 63	
Stationery and printing				284 67	
Postage				261 97	
Telephone and telegraph				643 38	
Miscellaneous				7,113 49	
					10,180 36
Total					$116,846 39

Construction of Barge Canal — Oswego Canal.

Chapter 147, Laws 1903.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Guy Moulton	Division engineer	$300 00 per month	$736 30	$39 27	$775 57
Henry B. Brewster	Division engineer	300 00 per month	100 00	....	100 00
T. M. Ripley	Resident engineer	200 00 per month	2,400 00	185 99	2,585 99
Edwin Styring	Resident engineer	200 00 per month	2,000 00	9 10	2,009 10

Construction of Barge Canal — Oswego Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
George H. Haley	Assistant engineer	$6 00 per day	$2,010 00	$21 25	$2,031 25
George H. Thomson	Assistant engineer	6 00 per day	1,878 00	357 66	2,235 66
George C. Andrews	Assistant engineer	6 00 per day	1,848 00	32 21	1,880 21
M. D. Ewell	Leveler	4 50 per day	1,152 00		1,152 00
H. H. Brown	Leveler	4 50 per day	1,458 00		1,458 00
D. H. Judson	Leveler	4 50 per day	1,444 50		1,444 50
Frank H. Flint	Leveler	4 50 per day	1,228 50		1,228 50
R. E. Swinney	Leveler	4 50 per day	1,201 50		1,201 50
W. S. Morris	Rodman	4 00 per day	372 00	6 33	378 33
Geo. C. Hannon	Rodman	4 00 per day	152 00	6 00	152 00
E. A. Dollard	Rodman	3 50 per day	1,123 50		1,123 50
R. E. Drake	Rodman	3 50 per day	213 50		213 50
W. C. R. Pyne	Rodman	4 00 per day	1,241 50		1,241 50
W. H. Hilborn	Rodman	3 50 per day	203 00		203 00
L. Kavanagh	Chainman	3 00 per day	453 00		453 00
J. C. Adams	Chianman	3 00 per day	123 00		123 00
L. H. Rutherford	Chianman	2 50 per day	845 00		845 00
L. Y. Meneely	Chainman	2 50 per day	150 00		150 00
Frank W. Donovan	Chainman	2 50 per day	107 50		107 50
Henry L. Bassett	Financial clerk	5 00 per day	265 00		265 00
Frank J. Kennedy	Financial clerk	5 00 per day	25 00		25 00
Harvey Wagner	Stenographer	100 00 per month	100 00		100 00
Leo B. Seigel	Stenographer	50 00 per month	400 00		400 00
S. P. Van Waters	Stenographer	50 00 per month	116 12		116 12
Carl F. Hopstein	Draftsman	5 00 per day	75 00	13 30	88 30
Henry A. J. Castor	Draftsman	4 50 per day	1,342 50		1,342 50
V. M. McConnell	Draftsman	4 00 per day	228 00		228 00
Harry Kehoe	Draftsman	4 50 per day	1,372 50		1,372 50
C. H. Mattison	Inspector	4 50 per day	81 00	13 55	94 55
W. N. Dutcher	Inspector	4 50 per day	1,280 00		1,280 00
L. A. MacSweeney	Inspector	4 50 per day	40 50		40 50
A. H. Hollenbeck	Inspector	4 50 per day	1,363 50		1,363 50
W. A. Walter	Inspector	4 50 per day	1,422 50		1,422 50
M. V. McCoy	Foreman of borings	3 50 per day	332 50	89 61	422 11
Thos. B. Bowes	Foreman of borings	3 50 per day	38 50		38 50
William R. Kelly	Boatman	3 00 per day	291 00		291 00
Thomas Redmond	Boatman	3 00 per day	288 00		288 00
A. J. Brosnehan	Axeman	2 00 per day	398 00		398 00
William Craham	Axeman	2 00 per day	666 00		666 00
F. W. Donovan	Axeman	2 00 per day	548 00		548 00
Thomas Keating	Axeman	2 00 per day	648 00		648 00
Alfred Moosbrugger	Axeman	2 00 per day	680 00		680 00
W. J. Carey	Axeman	2 00 per day	362 00		362 00
Frank Layburn	Axeman	2 00 per day	396 00		396 00
Geo. E. Sweeting	Axeman	2 00 per day	24 00		24 60
John Kelly	Laborer	2 00 per day	50 00		50 00
Edward J. Igoe	Laborer	2 00 per day	96 00		96 00
Alfred Moran	Laborer	2 00 per day	358 00		358 00
John W. Audlin	Laborer	2 00 per day	216 00		216 00
Guy W. Jones	Laborer	2 00 per day	310 00		310 00
Clark H. Norton	Laborer	2 00 per day	52 00		52 00
F. B. Ostrander	Laborer	2 00 per day	52 00		52 00
John Longway	Laborer	2 00 per day	66 00		66 00
John E. Smith	Laborer	2 00 per day	80 00		80 00
W. A. Shaw	Laborer	2 00 per day	158 00		158 00
Bird D. Kneeland	Laborer	2 00 per day	144 00		144 00
Sylvester Willse	Laborer	2 00 per day	84 00		84 00
M. C. Plunkett	Laborer	2 00 per day	142 00		142 00
Joseph Griffin	Laborer	2 00 per day	196 00		196 00
Frank O'Brien	Laborer	2 00 per day	24 00		24 00
James Kenyon	Laborer	2 00 per day	186 00		186 00
James Mehegan	Laborer	2 00 per day	180 00		180 00
J. W. Main	Laborer	2 00 per day	20 00		20 00
J. W. Howard	Laborer	2 00 per day	16 00		16 00
Thomas Dunn	Laborer	2 00 per day	22 00		22 00
John W. Smith	Laborer	2 00 per day	22 00		22 00
Frank M. Hughes	Gage reader	12 00 per month	144 00		144 00
Geo. Archambo	Gage reader	6 00 per month	72 00		72 00
J. M. Johnson	Gage reader	5 00 per month	30 00		30 00
Samuel Purdy	Gage reader	5 00 per month	20 00		20 00
Smith Sharp	Gage reader	5 00 per month	60 00		60 00
Roy L. Smith	Gage reader	5 00 per month	60 00		60 00
L. D. Sterling	Gage reader	5 00 per month	60 00		60 00

Construction of Barge Canal — Oswego Canal — (Concluded).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
D. D. Tompkins	Gage reader	$5 00 per month	$60 00	....	$60 00
Arthur C. Owens	Gage reader	5 00 per month	40 00	....	40 00
B. M. Wilcox	Gage reader	5 00 per month	30 00	....	30 00
Fulton Livery Co	....	....	....	$3 00	3 00
			$38,274 42	$771 27	$39,045 69

Incidental Expenses.

Instruments and tools	$200 46	
Stationery and printing	66 16	
Fuel and light	214 52	
Postage	75 75	
Office rent	689 96	
Telephone and telegraph	186 07	
Miscellaneous	1,340 82	
		2,773 74
Total		$41,819 43

Improvement of Public Highways.

Chapter 115, Laws of 1898, and amendatory laws.
(From October 1, 1908, to February 17, 1909.)

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Henry B. Brewster	Division engineer	$300 00 per month	$400 00	$163 88	$563 88
Guy Moulton	Division engineer	300 00 per month	75 00	....	75 00
Fred W. Sarr	First resident engineer	225 00 per month	499 11	183 92	683 03
R. J. Marcher	Resident engineer	200 00 per month	921 43	90 35	1,011 78
H. E. Smith	Resident engineer	200 00 per month	921 43	46 52	967 95
Geo. R. Winslow	Resident engineer	200 00 per month	921 43	78 93	1,000 36
L. C. Hulburd	Resident engineer	200 00 per month	638 71	70 16	708 87
W. H. Van Wie	Resident engineer	200 00 per month	282 70	19 89	302 59
Guy H. Miller	First assistant engineer	7 00 per day	882 00	353 49	1,235 49
Frank W. Bristow	Assistant engineer	6 00 per day	474 00	227 74	701 74
L. D. Brownell	Assistant engineer	6 00 per day	486 00	50 00	536 00
Joseph P. Burns	Assistant engineer	6 00 per day	720 00	50 66	770 66
J. Otis Burt	Assistant engineer	6 00 per day	588 00	15 34	603 34
R. V. Collins	Assistant engineer	6 00 per day	744 00	105 46	849 46
Louis Garbi, Jr	Assistant engineer	6 00 per day	762 00	154 68	916 68
David R. Lee	Assistant engineer	6 00 per day	240 00	5 55	245 55
F. F. Miller	Assistant engineer	6 00 per day	702 00	38 06	740 06
C. J. Myers	Assistant engineer	6 00 per day	726 00	52 51	778 51
A. L. Northrup	Assistant engineer	6 00 per day	732 00	201 36	933 36
O. M. Severson	Assistant engineer	6 00 per day	366 00	9 11	375 11
Wm. H. Snyder	Assistant engineer	6 00 per day	756 00	36 57	792 57
J. N. Slater	Assistant engineer	6 00 per day	774 00	149 83	923 83
Fred'k S. Strong	Assistant engineer	6 00 per day	840 00	266 62	1,106 62
Spencer J. Stewart	Assistant engineer	6 00 per day	798 00	143 85	941 85
Emerson H. Stewart	Assistant engineer	6 00 per day	750 00	204 60	954 60
Nathan E. Young	Assistant engineer	6 00 per day	750 00	52 48	802 48
T. F. Nichols	Assistant engineer	6 00 per day	174 00	3 60	177 60
Harvey F. Hawley	Assistant engineer	6 00 per day	720 00	....	720 00
D. E. Whitford	Assistant engineer	6 00 per day	318 00	....	318 00
Geo. W. Bradley	Assistant engineer	5 00 per day	600 00	131 78	731 78
James Dollard	Assistant engineer	5 00 per day	605 00	8 05	613 05
Edward M. Ellis	Assistant engineer	5 00 per day	190 00	4 05	194 05
Chapin E. C. Harris	Assistant engineer	5 00 per day	600 00	5 60	605 60
Robert B. Hoadley, Jr	Assistant engineer	5 00 per day	630 00	22 00	652 00
J. M. Howard	Assistant engineer	5 00 per day	285 00	25 30	310 30
Stephen B. McDonald	Assistant engineer	5 00 per day	285 00	2 40	287 40
R. E. Miller	Assistant engineer	5 00 per day	300 00	74 15	374 15
C. D. Murray	Assistant engineer	5 00 per day	290 00	26 95	316 95
Thomas D. Ringwood	Assistant engineer	5 00 per day	285 00	....	285 00
A. L. Sayer	Assistant engineer	5 00 per day	320 00	325 97	645 97
H. R. Starbird	Assistant engineer	5 00 per day	600 00	482 37	1,082 37
Frank C. Tolles	Assistant engineer	5 00 per day	305 00	32 74	337 74

Improvement of Public Highways —(Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
S. M. Witbeck	Assistant engineer	$5 00 per day	$600 00		$600 00
L. H. Marsland	Assistant engineer	5 00 per day	305 00		305 00
P. F. McClellan	Assistant engineer	5 00 per day	10 00		10 00
Rexford Lyon	Leveler	5 00 per day	30 00		30 00
Roy F. Hall	Leveler	4 50 per day	540 00	$14 15	554 15
L. L. Graham	Leveler	4 50 per day	40 50	3 70	44 20
Louis Oppenheim	Leveler	4 50 per day	288 00	1 90	289 90
R. E. Swinney	Leveler	4 50 per day	234 00	10 80	244 80
J. B. Whipple	Leveler	4 50 per day	265 50	5 55	271 05
H. W. Benkart	Leveler	4 50 per day	27 00		27 00
Chas. C. Cassel	Leveler	4 50 per day	585 00	44 91	629 91
E. A. Dahmen	Leveler	4 50 per day	265 50	13 90	279 40
C. F. deClercq	Leveler	4 50 per day	67 50	3 53	71 03
W. W. Ewell	Leveler	4 50 per day	540 00	47 51	587 51
B. J. Finch	Leveler	4 50 per day	553 50	4 40	557 90
D. W. Chamberlain	Leveler	4 50 per day	571 50		571 50
F. H. Flint	Leveler	4 50 per day	207 00	19 35	226 35
W. S. Saxton	Leveler	4 50 per day	436 50		436 50
Geo. Yavroumis	Leveler	4 50 per day	184 50		184 50
Geo. J. Goehl	Inspector	4 50 per day	567 00	8 40	575 40
C. R. Madden	Inspector	4 50 per day	558 00		558 00
John Duignan	Inspector	4 50 per day	580 50		580 50
D. B. Stitt	Inspector	4 50 per day	265 50		265 50
L. A. MacSweeney	Inspector	4 50 per day	297 00		297 00
E. W. Parsons	Inspector	4 50 per day	549 00		549 00
C. H. Mattison	Inspector	4 50 per day	27 00	8 87	35 87
M. D. Poulsen	Inspector	4 00 per day	228 00		228 00
W. E. McNasser	Inspector	4 00 per day	496 00	55 92	551 92
R. G. Pellett	Inspector	3 50 per day	430 50		430 50
W. J. O'Brien	Inspector	3 50 per day	527 00	181 40	708 40
B. D. Isenhour	Inspector	3 50 per day	213 50	11 46	224 96
A. J. Adams	Inspector	3 50 per day	199 50		199 50
G. F. Wilcox	Inspector	3 50 per day	290 50		290 50
F. H. Mongin	Inspector	3 50 per day	427 00	8 35	435 35
C. W. Johnson	Inspector	3 50 per day	517 50	6 25	523 75
S. A. Patterson	Inspector	3 50 per day	42 00		42 00
Chas. H. Roberts	Inspector	3 50 per day	434 00	52 32	480 32
A. H. Scheutzow	Inspector	3 50 per day	451 50		451 50
D. R. Thornton	Inspector	3 50 per day	210 00		210 00
T. M. Lawrence	Inspector	3 50 per day	199 50		199 50
A. M. McEnerey	Inspector	3 50 per day	210 00		210 00
W. J. Wilds	Inspector	3 50 per day	357 00		357 00
Don A. Wilcox	Inspector	3 50 per day	94 50		94 50
D. B. Willson	Inspector	3 50 per day	199 50		199 50
D. J. Fitzgerald	Inspector	3 50 per day	430 50		430 50
L. M. Cowen	Inspector	3 50 per day	423 50		423 50
James J. Keenan	Inspector	3 50 per day	217 00		217 00
H. L. Whitney	Inspector	3 50 per day	420 00		420 00
B. A. Redington	Inspector	3 50 per day	430 50		430 50
H. G. Hotchkiss, Jr.	Inspector	4 50 per day	502 00		502 00
J. G. Wynkoop	Inspector	4 50 per day	461 00	4 10	465 10
L. Holmes	Bridge designer	175 00 per month	806 25	220 87	1,027 12
S. H. DePuy	Draftsman	5 00 per day	645 00	27 65	672 65
Ward J. Hager	Draftsman	4 00 per day	480 00		480 00
H. B. Hoyt	Draftsman	4 00 per day	28 00		28 00
A. E. Upson	Tracer	50 00 per month	230 35		230 35
Geo. C. Hannon	Rodman	4 00 per day	428 00	14 60	442 60
J. F. Maher	Rodman	4 00 per day	408 00	160 06	568 06
F. A. Gordon	Rodman	4 00 per day	420 00		420 00
E. DeV. Kelly	Rodman	4 00 per day	240 00		240 00
Wm. S. Morris	Rodman	4 00 per day	28 00		28 00
Jacob A. Erhardt	Rodman	3 50 per day	434 00	3 50	437 50
W. C. Slayton	Rodman	3 50 per day	199 50		199 50
George C. House	Rodman	3 50 per day	423 50		423 50
R. D. Wiswell	Rodman	3 50 per day	213 50		213 50
Geo. W. Wright	Rodman	3 50 per day	206 50		206 50
W. A. Spelman	Rodman	3 50 per day	437 50	3 50	441 00
A. B. Cadebec	Rodman	3 50 per day	217 00		217 00
Sampson Brettheimer	Rodman	3 50 per day	206 50		206 50
Jerry P. Lynch	Rodman	3 50 per day	283 50		283 50
P. H. Budd	Rodman	3 50 per day	157 50		157 50
Lynn T. Farnham	Rodman	3 50 per day	38 50		38 50
Leigh Robartes	Rodman	3 50 per day	10 50		10 50
E. C. Dollard	Rodman	3 50 per day	434 00		434 00

Improvement of Public Highways —(Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
John D. Rust	Rodman	$3 50 per day	$199 50		$199 50
B. F. Taylor	Rodman	3 50 per day	206 50		206 50
D. W. Scripture	Chainman	3 00 per day	369 00		369 00
Frank Lutz	Chianman	3 00 per day	156 00		156 00
E. E. Babcock	Chainman	2 50 per day	145 00		145 00
R. C. Pugh	Chainman	2 50 per day	310 00	$1 06	311 06
C. H. Vandenburg	Chainman	2 50 per day	65 00		65 00
R. B. Graham	Chainman	3 00 per day	372 00	20 11	392 11
J. J. Coleman	Chainman	2 50 per day	142 50		142 50
J. T. Crawford	Chainman	2 50 per day	10 00		10 00
L. Kavanagh	Chainman	3 00 per day	45 00		45 00
G. A. Payne	Chainman	2 50 per day	20 00		20 00
Fred M. Teel	Chainman	2 50 per day	342 50		342 50
W. H. Carnrike	Chainman	2 50 per day	142 50		142 50
N. H. Whittemore	Chainman	2 50 per day	145 00		145 00
Paul Ryan	Chainman	2 50 per day	147 50		147 50
G. V. Purchase	Chainman	2 50 per day	127 50		127 50
Don A. Wilcox	Chainman	3 00 per day	156 00		156 00
Howard U. Lyon	Estimate clerk	150 00 per month	391 07		391 07
Frank J. Kennedy	Financial clerk	5 00 per day	65 00		65 00
Harvey Wagner	Stenographer	100 00 per month	200 00		200 00
C. H. Morgan	Stenographer	100 00 per month	460 71		460 71
John W. Davin	Axeman	2 00 per day	54 00	13 75	67 75
John A. Palmer	Axeman	2 00 per day	10 00	1 08	11 08
Warren Luther	Axeman	2 00 per day	246 00		246 00
J. C. Mitchell	Axeman	2 00 per day	114 00		114 00
J. K. Smith	Axeman	2 00 per day	220 00	3 38	223 38
J. H. Wallace	Axeman	2 00 per day	124 00		124 00
R. E. Gallivan	Axeman	2 00 per day	208 00		208 00
Howard B. Lincoln	Axeman	2 00 per day	7 00		7 00
A. M. Kelly	Axeman	2 00 per day	114 00		114 00
Chas. H. Henrick	Axeman	2 00 per day	124 00		124 00
John H. Donovan	Axeman	2 00 per day	54 00		54 00
Emerson Fitch	Axeman	2 00 per day	248 00		248 00
J. C. Heckles	Axeman	2 00 per day	96 00		96 00
H. F. Lembeck	Axeman	2 00 per day	114 00		114 00
J. R. Curtin	Axeman	2 00 per day	242 00	1 25	243 25
C. A. Porter	Axeman	2 00 per day	118 00	2 20	120 20
H. K. Donnelly	Axeman	2 00 per day	244 00		244 00
W. J. Carey	Axeman	2 00 per day	174 00		174 00
Ray Gorton	Axeman	2 00 per day	132 00		132 00
L. S. Edwards	Axeman	2 00 per day	132 00		132 00
G. H. Armstrong	Axeman	2 00 per day	116 00		116 00
F. M. Cronin	Axeman	2 00 per day	122 00	4 30	126 30
P. J. Blake	Axeman	2 00 per day	118 00		118 00
F. W. Harvey	Axeman	2 00 per day	188 00	1 23	189 23
Frank Layburn	Axeman	2 00 per day	180 00		180 00
Frank J. O'Neil	Axeman	2 00 per day	240 00		240 00
M. J. Finneran	Axeman	2 00 per day	242 00		242 00
E. E. Kingston	Axeman	2 00 per day	120 00		120 00
B. J. Reilly	Axeman	2 00 per day	246 00		246 00
J. E. Snyder	Axeman	2 00 per day	248 00		248 00
C. R. McEllen	Axeman	2 00 per day	114 00		114 00
W. R. Eggleston	Axeman	2 00 per day	116 00		116 00
H. J. O'Brien	Axeman	2 00 per day	116 00		116 00
R. F. Mott	Axeman	2 00 per day	120 00		120 00
J. A. Brennan	Axeman	2 00 per day	114 00		114 00
J. J. Carroll	Axeman	2 00 per day	118 00		118 00
F. J. Gehan	Axeman	2 00 per day	86 00		86 00
John Tracy	Axeman	2 00 per day	116 00		116 00
C. I. Stratton	Axeman	2 00 per day	246 00		246 00
M. W. Hughes	Axeman	2 00 per day	114 00		114 00
James Daley	Axeman	2 00 per day	114 00		114 00
Robert D. Cameron	Axeman	2 00 per day	118 00		118 00
Louis Heineman	Axeman	2 00 per day	248 00		248 00
Chas. J. Delaney	Axeman	2 00 per day	262 00		262 00
J. H. Klock	Axeman	2 00 per day	4 00		4 00
C. H. Hike	Laborer	2 00 per day	182 00		182 00
George Crowe	Laborer	2 00 per day	122 00		122 00
Carlisle Pontius	Laborer	2 00 per day	86 00		86 00
Frank Griffin	Laborer	2 00 per day	218 00		218 00
William Curley	Laborer	2 00 per day	246 00		246 00
Frank L. Ryan	Laborer	2 00 per day	244 00		244 00
D. McCarthy	Laborer	2 00 per day	114 00		114 00

Improvement of Public Highways —(Concluded).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Charles Abel	Laborer	$2 00 per day	$174 00	$111 34	$285 34
Henry Turk	Laborer	2 00 per day	174 00		174 00
Clark H. Norton	Laborer	2 00 per day	158 00		158 00
James B. Hill	Laborer	2 00 per day	174 00		174 00
John Sheridan	Laborer	2 00 per day	174 00		174 00
Francis Holleran	Laborer	2 00 per day	114 00		114 00
John H. Donovan	Laborer	2 00 per day	120 00		120 00
Rudolph Beigel	Laborer	2 00 per day	16 00		16 00
John Kelly	Laborer	2 00 per day	16 00		16 00
			$60,390 69	$5,013 17	$65,403 86
Incidental Expenses.					
Livery				$2,854 90	
Stationery and printing				49 49	
Fuel and light				51 93	
Postage				130 90	
Office rent				798 85	
Telephone and telegraph				324 63	
Miscellaneous				1,182 76	
					5,393 46
Total					$70,797 32

Maintenance and Repairs of Improved Public Highways.

Chapter 115, Laws of 1898; chapter 468, Laws of 1906; chapter 686, Laws of 1906.

Road No.	NAME OF ROAD.	Town.	County.	Amount.
47	Chenango river	Chenango and Dickinson.	Broome	$2,295 84
125	Lestershire	Union	Broome	4,033 80
126	Town Line Extension	Chenango	Broome	104 88
127	Park Bridge	Kirkwood	Broome	1,294 15
134	Fenton	Fenton	Broome	155 83
174	Endicott	Union	Broome	33 65
175	Chenango Towpath	Fenton	Broome	563 00
209	Nineveh	Colesville	Broome	68 39
383	Owasco	Owasco	Cayuga	837 16
112	Norwich-Plymouth	Norwich and Plymouth	Chenango	2,043 78
218	Greene Smithville Flats	Greene and Smithville	Chenango	2,466 45
111	Blodgett's Mills	Cortlandville	Cortland	75 41
123	Preble-Homer	Preble	Cortland	135 25
208	Cortland-Homer	Cortlandville	Cortland	80 72
215	Dryden	Cortlandville	Cortland	89 03
377	Cincinnatus	Cincinnatus	Cortland	10 70
378	McGrawville	Cortlandville	Cortland	150 98
147	Burrs Mills	Watertown and Rutland.	Jefferson	32 50
181	Watertown-Sacketts Harbor Henderson, section 1	Hounsfield	Jefferson	40 12
183	Adams-Henderson, section 1.	Adams	Jefferson	137 77
184	Pierrepont Manor-Ellisburg	Ellisburg	Jefferson	49 00
185	State	Lorraine	Jefferson	641 58
234	Adams-Henderson, section 2	Adams and Henderson	Jefferson	349 98
424	Belleville-Adams, section 1	Ellisburg and Adams	Jefferson	65 10
71	Utica-Paris	New Hartford	Oneida	1,122 66
139	Hamilton Bridge	Vernon	Oneida	510 00
140	Seneca Turnpike	Vernon	Oneida	23 25
49	Fabius-Apulia, section 1	Fabius	Onondaga	564 55
75	Fabius-Apulia, section 2	Fabius	Onondaga	2,671 55
122	East Lake	Skaneateles	Onondaga	2,371 52
291	Cemetery	Onondaga	Onondaga	151 65
430	Jordan Valley, section 1	Elbridge	Onondaga	50 00
280	Oswego-Sterling	Oswego	Oswego	53 21
	Division office			262 44
	Total			$23,535 88

Mill Street Bridge, Cazenovia.

Chapter 281, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Fred. J. Wagner	First resident engineer	$250 00 per month	$60 00	$5 68	$65 68
David R. Lee	Assistant engineer	6 00 per day	444 00	16 81	460 81
L. D. Brownell	Assistant engineer	6 00 per day	30 00	4 18	34 18
			$534 00	$26 67	$560 67
	Incidental Expenses.				
Postage				$0 20	
Telephone and telegraph				35	
Miscellaneous				38 78	
					39 33
Total					$600 00

Ovid Street Bridge, Seneca Falls.

Chapter 273, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Geo. E. Maynard	Bridge draftsman	$110 00 per month	$34 60	$10 10	$44 70
A. G. Hayden	Bridge designer	160 00 per month	111 52		111 52
E. G. Semon	Bridge designer	125 00 per month	96 49		96 49
J. C. Podmore	Bridge draftsman	125 00 per month	13 39		13 39
H. D. Miller	Bridge designer	175 00 per month	22 58		22 58
G. M. Braune	Bridge designer	175 00 per month	11 29		11 29
Total			$289 87	$10 10	$299 97

North Salina Street Bridge, Syracuse.

Chapter 668, Laws of 1906.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
David R. Lee	Assistant engineer	$6 00 per day	$132 00		$132 00
	Incidental Expenses.				
Postage				$0 18	
					0 18
Total					$132 18

Seneca Street Bridge, Utica.

Chapter 454, Laws of 1909.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
John Bartholomew...	Bridge designer..................	$175 00 per month	$201 35	$5 00	$206 35
C. N. Haggart........	Bridge designer	175 00 per month	175 00	....	175 00
W. P. Falkenstein....	Bridge draftsman........	110 00 per month	110 00	....	110 00
R. M. Wheeler........	Bridge draftsman	110 00 per month	161 33	... .	161 33
C. Cyrus Podmore....	Bridge draftsman..............	150 00 per month	9 33	....	9 33
F. E. Blake...........	Bridge draftsman..........	110 00 per month	11 67	....	11 67
Chas. E. Quimby......	Junior bridge draftsman.......	75 00 per month	58 79	....	58 79
Chas. P. Wiweke......	Mechanical draftsman.....	90 00 per month	17 42	....	17 42
J. A. Jensen..........	Mechanical draftsman....	110 00 per month	6 45	....	6 45
J. L. Southworth......	Engineering draftsman..	4 00 per day	56 00	....	56 00
Total..			$807 34	$5 00	$812 34

Durhamville Aqueduct.

Chapter 672, Laws of 1907.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
J. Otis Burt..........	Assistant engineer.............	$6 00 per day	$132 00	$3 00	$135 00
	Incidental Expenses.				
Postage.......				$0 51	0 51
Total..					$135 51

Cayuga and Seneca Canal Survey.

Chapter 433, Laws of 1909.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
L. S. Hulburd........	Assistant engineer.........	$6 00 per day	$156 00	$191 33	$347 33
J. H. Sturdevant......	Assistant engineer............ ...	6 00 per day	156 00	....	156 00
B. I. Hall	Assistant engineer..............	5 00 per day	85 00	.. ..	85 00
E. A. Deschak........	Leveler............................	4 50 per day	117 00	....	117 00
R. G. Pratt...........	Rodman.........................	3 50 per day	91 00	....	91 00
H. J. Stabile..........	Rodman.........................	3 50 per day	91 00	....	91 00
J. M. Prior...........	Rodman	3 50 per day	91 00	....	91 00
C. H. Adams..........	Chainman.................. .	3 00 per day	78 00	....	78 00
H. J. Spelman........	Chainman..................	2 50 per day	65 00	... .	65 00
G. E. Schaefer........	Chainman	2 50 per day	67 50	.. ..	67 50
G. A. Payne.........	Chainman...	2 50 per day	65 00	....	65 00
K. Moulton..........	Chainman	2 50 per day	52 50	... .	52 50
H. Kramer..........	Foreman of borings	4 50 per day	117 00	....	117 00
H. W. Stoneburg... ..	Foreman of borings...........	4 00 per day	92 00	....	92 00
J. J. Brueckel.........	Axeman.....................	2 00 per day	52 00	. ...	52 00
J. C. Sophian.........	Chainman...................	2 50 per day	10 00	....	10 00
F. W. Pettit..........	Laborer.....................	2 00 per day	52 00	.. ..	52 00
W. C. Emens.........	Laborer.....................	2 00 per day	52 00	....	52 00
C. W. Avery..........	Laborer.....................	2 00 per day	52 00	....	52 00
J. A. Smith...........	Laborer.....................	2 00 per day	52 00	....	52 00
L. E. Moyer..........	Laborer.....................	2 00 per day	52 00	....	52 00
M. H. McConnell......	Laborer.....................	2 00 per day	32 00	....	32 00

Cayuga and Seneca Canal Survey — (Concluded).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
F. DeBeukelaer	Laborer	$2 00 per day	$32 00	....	$32 00
J. W. Seaton	Laborer	2 00 per day	32 00	....	32 00
R. H. Byrne	Laborer	2 00 per day	32 00	....	32 00
H. Heffernan	Laborer	2 00 per day	30 00	....	30 00
D. C. McGill	Laborer	2 00 per day	26 00	....	26 00
E. C. Ansley	Laborer	2 00 per day	20 00	....	20 00
H. B. Taylor	Laborer	2 00 per day	10 00	....	10 00
N. C. Zeluff	Laborer	2 00 per day	8 00	....	8 00
Clarence Phelps	Laborer	2 00 per day	8 00	....	8 00
L. F. French	Laborer	2 00 per day	6 00	....	6 00
H. W. Sullivan	Laborer	2 00 per day	2 00	....	2 00
John Coleman	Laborer	2 00 per day	2 00	....	2 00
Thomas Welch	Laborer	2 00 per day	2 00	....	2 00
H. O. Caldwell	Laborer	2 00 per day	2 00	....	2 00
C. S. Sterling	Boatman	3 00 per day	12 00	....	12 00
			$1,904 00	$191 33	$2,095 33
Incidental Expenses.					
Stationery and printing				$0 65	
Livery				42 50	
Fuel and light				13	
Postage				1 10	
Office rent				15 00	
Telephone and telegraph				2 30	
Miscellaneous				107 52	
					169 20
Total					$2,264 53

Surveys for State Court of Claims.

Chapter 576, Laws of 1906; Chapter 466, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Theron M. Ripley	Resident engineer	$200 00 per month	....	$218 35	$218 35
L. D. Brownell	Assistant engineer	6 00 per day	$594 00	108 75	702 75
D. E. Whitford	Assistant engineer	6 00 per day	936 00	....	936 00
David R. Lee	Assistant engineer	6 00 per day	138 00	2 70	140 70
Edward M. Ellis	Assistant engineer	5 00 per day	50 00	10 48	60 48
E. J. Berry	Leveler	5 00 per day	5 00	2 79	7 79
Geo. C. Hannon	Rodman	4 00 per day	204 00	....	204 00
A. T. Madison	Rodman	3 50 per day	31 50	....	31 50
Carl F. Hopstein	Draftsman	5 00 per day	40 00	110 50	150 50
R. K. Sheldon	Draftsman	5 00 per day	40 00	....	40 00
Chas. G. Lamphere	Tracer	75 00 per month	24 19	....	24 19
L. W. Moulton	Laborer	2 00 per day	14 00	....	14 00
James Glenn	Laborer	2 00 per day	11 00	....	11 00
Urban Karcher	Laborer	1 50 per day	7 50	....	7 50
E. L. Scarritt	Laborer	1 50 per day	7 50	....	7 50
			$2,102 69	$453 57	$2,556 26
Incidental Expenses.					
Livery				$30 00	
Postage				08	
Telephone and telegraph				65	
Miscellaneous				11 92	
					42 65
Total					$2,598 91

SUMMARY.

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals.

1.	Erie canal, chapter 465, Laws of 1908	$8,414 76
2.	Cayuga and Seneca canal, chapter 465, Laws of 1908	420 61
3.	Black River canal, chapter 465, Laws of 1908	164 63

Construction of Barge Canal.

4.	Construction of Barge canal, Erie canal, chapter 147, Laws of 1903	116,846 39
5.	Construction of Barge canal, Oswego canal, chapter 147, Laws of 1903	41,821 43

Improvement of Public Highways.

6.	Improvement of Public Highways, chapter 115, Laws of 1898	70,797 32
7.	Maintenance and repairs of improved public highways, chapter 115, Laws of 1898; chapter 686, Laws of 1906	23,535 88

Special Work.

9.	Mill street bridge, Cazenovia, chapter 281, Laws of 1908	600 00
10.	Ovid street bridge, Seneca Falls, chapter 273, Laws of 1908	299 97
11.	North Salina street bridge, Syracuse, chapter 668, Laws of 1906	132 18
12.	Seneca street bridge, Utica, chapter 454, Laws of 1909	812 34
13.	Durhamville aqueduct, chapter 672, Laws of 1908	135 51

Special Surveys.

14.	Cayuga and Seneca canal survey, chapter 433, Laws of 1909	2,264 53
15.	Surveys for State Court of Claims, chapter 466, Laws of 1908	2,598 91
	Total	$268,844 46

TABLE OF CONTRACTS COMPLETED ON THE MIDDLE DIVISION DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1909.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Appropriation.	Contract price.	Final payment.
			Chap.	Year.			
John M. Shultz	Jan. 15, 1907	Constructing a lift bridge over the Oswego canal at North Salina street, Syracuse	668	1906	*$75,000 00	$65,686 00	$68,434 73
John Young and Patrick J. Cawley	July 8, 1908	Constructing a protection wall on the west side of Skaneateles lake outlet	675 400 394	1906 1907 1908	15,000 00	11,893 00	11,444 60
Montour Steel Co.	Dec. 20, 1908	Constructing a plate girder bridge over the outlet of Cazenovia lake at Mill street, Cazenovia, Madison county	281	1908	6,000 00	4,041 50	4,011 20

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* $31,250 appropriated by the city of Syracuse and $12,500 by Syracuse Rapid Transit Railway.

Improvement of Public Highways.

Chapter 115, Laws of 1898, and amendatory laws.

(Completed between October 1, 1908, and February 17, 1909.)

CONTRACTOR.	Date of contract.	Character of work.	Contract price.	Final payment.
John Weber & Sons, Inc	Dec. 31, 1906	Cortland-Homer road, No. 208, Cortland county	$7,545 00	$7,492 15
Celestin C. Burns	July 2, 1906	Adams-Henderson (section 2) road, No. 234, Jefferson county	45,176 00	56,160 81
Casey & Murray	Sept. 15, 1906	Utica-Oneida Castle (section 1) road, No. 271, Oneida county	79,800 00	93,224 18
Chambers & Grady	Dec. 4, 1907	Seneca River road-North Side, No. 273, Seneca county	15,880 50	15,180 43
County of Broome	July 12, 1906	Union-Maine road, No. 275, Broome county	30,604 00	30,160 32
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Syracuse-Watertown road, No. 278, Oswego county	23,475 80	23,217 76
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	West Oswego River road, No. 279, Oswego county	25,423 35	24,075 85
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Skaneateles-Hamilton road, No. 330, Onondaga county	27,093 00	23,995 34
County of Tompkins	Aug. 30, 1906	Cayuga Heights road, No. 336, Tompkins county	33,182 00	32,147 75
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Syracuse turnpike, No. 337, Madison county	12,525 30	12,104 92
County of Tompkins	Aug. 30, 1908	Catskill turnpike (section 2) road, No. 338, Tompkins county	13,111 00	13,279 75

TABLE OF CONTRACTS COMPLETED ON THE MIDDLE DIVISION DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1909 — (Continued).

Improvement of Public Highways — (Continued).

CONTRACTOR.	Date of contract.	Character of work.	Contract price.	Final payment.
Wm. I. Tyler	Sept. 18, 1906	Georgetown road, No. 339, Madison county	$27,487 50	$27,395 74
John H. Gordon	Nov. 23, 1906	Augusta road, Augusta section, No. 368, Oneida county	34,500 00	34,248 22
County of Broome	July 12, 1906	Maine road, No. 374, Broome county	32,902 60	32,879 21
John Weber & Sons, Inc	Sept. 19, 1906	Harford road, No. 379, Cortland county	6,868 00	6,758 70
Mott & Kemper	Nov. 14, 1906	State road, Homer, No. 380, Cortland county	37,300 00	37,740 79
Scofield Company & M. F. Dollard	Nov. 10, 1906	Fleming road, No. 384, Cayuga county	28,250 00	28,135 07
County of Broome	July 12, 1906	Vestal road, No. 420, Broome county	35,287 18	35,338 23
Casey & Murray	Dec. 2, 1907	Conklin road, No. 421, Broome county	80,191 25	79,930 09
Wm. J. Semper	Mar. 23, 1908	State (section 2) road, No. 426, Jefferson county	45,330 50	43,406 36
Stewart-Kerbaugh-Shanley Company	Dec. 8, 1907	Watertown-Carthage (section 3) road, No. 428, Jefferson county	32,047 55	30,431 84
J. Charles Dayton	July 20, 1906	Skaneateles-Spafford road, No. 431, Onondaga county	25,997 00	26,773 37
M. F. Dollard	Aug. 29, 1906	Augusta road (Lowell and Spencer sections), No. 438, Oneida Co	66,666 00	78,201 05
Joseph McCormick	Dec. 20, 1907	Lisle-Center Lisle road, No. 445, Broome county	31,362 45	30,898 27
County of Tompkins	Aug. 30, 1906	Wyckoff road, No. 455, Tompkins county	3,851 25	3,543 15
John Young	Nov. 10, 1906	Skaneateles West Lake (sections 1, 2 and 3) road, No. 486, Onondaga county	31,994 00	31,237 43
Daniel V. Brown	Nov. 10, 1906	Elbridge road, No. 487, Onondaga county	36,487 00	36,445 92
John Weber & Sons, Inc	July 10, 1906	Homer-Tully (section 1) road, No. 510, Cortland county	25,770 00	24,275 70
Casey & Murray	Sept. 19, 1907	Utica-Bridgewater road, No. 559, Oneida county	76,347 00	93,839 51
Casey & Murray	Sept. 19, 1907	Mohawk River road, Rome, No. 560, Oneida county	23,406 70	22,256 99
Brown & Lowe	Jan. 29, 1908	Rome-Northwestern (section 1) road, No. 561, Oneida county	46,000 47	58,800 25
Scofield Co. and Fred. T. Ley & Co.	Nov. 10, 1908	Auburn-Seneca Falls (section 1) road, No. 590, Cayuga county	69,660 00	....
Jeremiah T. Finch	Nov. 15, 1906	Moravia-Niles road, No. 591, Cayuga county	82,392 00	82,156 99
Chambers & Grady	Sept. 18, 1906	Auburn-Elbridge road, No. 592, Cayuga county	47,000 00	48,006 43
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Norwich-South New Berlin (section 1) road, No. 596, Chenango Co.	32,988 50	32,279 90
Newport Construction Co	Oct. 22, 1907	Norwich-Kings Settlement road, No. 597, Chenango county	33,127 25	32,465 05
Stewart-Kerbaugh-Shanley Company	Dec. 14, 1907	Norwich-Preston road, No. 598, Chenango county	52,664 60	52,598 05
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Cayuga Heights-Hanshaw Corners road, No. 606, Tompkins county	21,511 75	20,819 03
Stewart-Kerbaugh-Shanley Company	Sept. 20, 1907	Trumansburg-Ithaca road, No. 616, Tompkins county	88,439 60	97,643 26
Stewart-Kerbaugh-Shanley Company	Dec. 18, 1907	Granby road, No. 653, Oswego county	57,586 00	56,946 64
Stewart-Kerbaugh-Shanley Company	Feb. 11, 1908	Chittenango-Oneida (section 2) road, No. 726, Madison county	77,721 10	77,723 81

TABLE OF CONTRACTS PENDING ON THE MIDDLE DIVISION, FEBRUARY 17, 1909.

Improvement of Public Highways.

Chapter 115, Laws of 1898, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price.	Payments to February 17, 1909.
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Redwood-Alexandria Bay (section 2) road, No. 236, Jefferson county	$38,200 00	$35,467 20	$25,930 50
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Coleman Hill (section 1) road, No. 245, Onondaga county	15,600 00	14,716 45	12,511 40
C. H. Quereau Co., Inc.	July 10, 1906	West Lake (section 2) road, No. 292, Onondaga county	10,550 00	9,350 00	7,911 31
C. H. Quereau Co., Inc.	July 10, 1906	East Lake (section 2) road, No. 293, Onondaga county	9,500 00	8,750 00	8,074 53
Henry C. Schroeder	Sept. 18, 1907	Reservation road, Fayette, No. 320, Seneca county	50,500 00	45,743 15	30,306 14
Wm. J. Dwyer	July 9, 1906	Collamer road, No. 348, Onondaga county	20,400 00	18,000 00	17,834 41
John Weber & Sons, Inc.	July 10, 1906	McGrawville road, No. 378, Cortland county	30,750 00	26,661 00	25,370 20
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	State road-Scott, No. 381, Cortland county	27,300 00	26,475 75	....
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Watertown-Theresa (section 3) road, No. 423, Jefferson county	40,350 00	39,419 85	7,232 08
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Phoenix-Pennellville road, No. 450, Oswego county	21,550 00	18,787 50	1,495 03
Stewart-Kerbaugh-Shanley Co.	Jan. 14, 1908	Minetto-Fulton road, No. 451, Oswego county	24,300 00	21,561 50	....
Wm. J. Dwyer	July 9, 1906	Cicero-South Bay road, No. 452, Onondaga county	33,100 00	28,937 95	12,348 76
County of Tompkins	Aug. 30, 1906	Catskill turnpike (section 3) road, No. 483, Tompkins county	44,400 00	35,655 25	23,202 82
Stewart-Kerbaugh-Shanley Co.	Oct. 18, 1907	Belle Isle road, No. 488, Onondaga county	17,800 00	17,633 90	13,847 84
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Massena-Waddington (sections 1, 2, 3 and 4) road, No. 521, St. Lawrence county	61,800 00	59,660 00	49,719 00
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Cortland-Dryden (section 2) road, No. 535, Cortland county	21,750 00	20,019 60	11,702 97
Brown & Lowe	Jan. 29, 1908	Rome-Northwestern (section 2) road, No. 562, Oneida county	41,400 00	37,685 38	2,875 84
Hyde, Hyde & Edy	Mar. 4, 1908	Rome-Taberg road, No. 563, Oneida county	60,350 00	49,660 42	29,592 09
Chambers & Grady	Dec. 4, 1907	Homer-Tully (section 2) road, No. 595, Cortland county	45,650 00	43,327 45	18,758 97
Delaware Construction Co.	Feb. 4, 1908	Smyrna-Otselic road, No. 599, Chenango county	62,400 00	60,169 90	32,419 24
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Auburn-Owasco road, No. 614, Cayuga county	59,000 00	54,662 15	34,631 64
Stewart-Kerbaugh-Shanley Co.	Dec. 18, 1907	Cato-Meridian-Baldwinsville road, No. 684, Cayuga county	59,400 00	55,752 65	46,921 83
Ryan & Yale	April 23, 1908	Ogdensburg-Canton (section 1) road, No. 732, St. Lawrence county	75,550 00	64,472 50	42,195 11
Ryan & Yale	April 23, 1908	Ogdensburg-Canton (section 2) road, No. 733, St. Lawrence county	80,100 00	67,115 65	45,181 77

TABLE OF CONTRACTS PENDING ON THE MIDDLE DIVISION, SEPTEMBER 30, 1909.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Appropriation.	Engineer's preliminary estimate.	Contract price.	Payments to September 30, 1909.
			Chapter.	Year.				
National Construction Co.	Nov. 1, 1906	Constructing stairways for the lift bridge at Catharine street, Syracuse	683	1906	$1,500 00	$1,065 50	$1,500 00	$675 00

Construction of Barge Canal.

Chapter 147, Laws of 1903, and amendatory laws.

CONTRACTOR.	Date of contract.	Character of work.	Engineer's preliminary estimate.	Contract price, as affected by alterations.	Payments to September 30, 1909.
Empire Engineering Corporation	April 18, 1905	Contract No. 4, Erie canal — The 4¾ miles east of Oneida lake	$812,560 00	$729,567 76	$579,858 29
Empire Engineering Corporation	April 18, 1905	Contract No. 5, Erie canal — Mosquito Point to Fox Ridge	421,252 50	375,871 57	113,238 00
The Groton Bridge Company	Aug. 10, 1906	Contract No. 7 — Bridges on contracts 4 and 5	39,883 30	42,989 90	41,896 00
McDermott Contracting Company	June 7, 1906	Contract No. 10, Oswego canal — Through Fulton	1,149,988 00	1,111,904 57	322,804 00
Stewart Kerbaugh-Shanley Company	Sept. 23, 1907	Contract No. 12, Erie canal — Oneida lake to Mosquito Point	3,082,560 00	3,514,819 16	778,351 51
Gilmour-Horton-Allen Company	Sept. 16, 1907	Contract No. 35, Oswego canal — Through Oswego	752,760 00	699,069 45	189,229 95
Shanley-Morrissey, Inc	July 9, 1909	Contract No. 42, Erie canal — Utica to Oriskany	1,312,814 00	1,163,625 00	16,011 00
Scott Brothers	May 6, 1908	Contract No. 45, Erie canal — Through Baldwinsville; Caughdenoy dam	425,124 00	469,881 05	307,683 00
Kinser Construction Company	Nov. 23, 1908	Contract No. 46, Erie canal — Fox Ridge to Galen town line	1,367,583 00	1,212,833 00	140,328 00
Scott Brothers	Aug 16, 1909	Contract No. 53, Oswego canal — Through Phoenix	200,500 00	166,735 00	1,413 00
Arthur McMullen	Oct. 19, 1908	Contract No. 55, Erie canal — Delta reservoir	1,014,525 00	905,347 00	181,449 00

WATER RECORDS OF CAYUGA LAKE, CROSS LAKE AND SENECA RIVER, AS PER CONCURRENT RESOLUTION OF 1884.

(Water-surface given below datum line.)

LOCATION.	Miles from Cayuga lock.	1908. December 9. Water-surface.			1909.						Remarks.
					May 7. Water-surface.			August 9. Water-surface.			
		Up-stream side.	Down-stream side.	Depth.	Up-stream side.	Down-stream side.	Depth.	Up-stream side.	Down-stream side.	Depth.	
Cayuga lake	0	....	—10.158	8.9	....	—7.55	......	....	—9.91	9.0	Depth on lock miter-sill.
Mud lock	1½	—10.334	....	8.7	—7.73	—7.80	11.83	—10.21	—10.21	9.1	Depth on miter-sill.
Canandaigua river south of canal	6¼	—13.830	....	2.1	—8.53	....	......	....	....	......	Depth of river.
Seneca river aqueduct	6⅓	....	—14.051	3.0	—8.71	—8.72	9.50	—14.81	—14.81	3.4	Depth on aqueduct foundation.
West Shore Railroad crossing	9	—14.409	....	1.5	—9.57	—9.61	8.20	—14.91	—14.91	4.3 10.1	Depth on natural bed. Depth in channel dredged.
N. Y. C. & H. R. R. crossing	10	—14.616	....	1.3	....	....	......	....	....	......	Depth on bridge foundation.
Mosquito Point	15¼	—17.156	....	3.0	—10.86	....	......	—11.87	....	......	Depth on natural bed.
Cross lake	25	—18.617	....	15.0	—11.87	....	......	—17.72	....	......	Depth at iron bridge.
Canandaigua river north of canal	6½	....	—14.220	2.2	....	—8.95	......	....	....	......	Depth of river.

REPORT

OF THE

DIVISION ENGINEER

OF THE

WESTERN DIVISION

For the Fiscal Year Ended September 30, 1909.

WESTERN DIVISION

State of New York,
Department of State Engineer and Surveyor,
Western Division.

Rochester, N. Y., *October* 1, 1909.

Hon. Frank M. Williams, *State Engineer and Surveyor, Albany, N. Y.:*

Sir.— I have the honor of submitting herewith my annual report as Division Engineer of the Western Division, for the fiscal year ended September 30, 1909.

The principal work of this division has consisted in performing the necessary engineering work in connection with the existing canal system, making surveys, plans and estimates and supervising the construction of the Barge canal, under chapter 147, Laws of 1903, and amendments thereto.

Also, in making surveys and plans and supervising the improvement of public highways, under chapter 115, Laws of 1898.

The work on highways was formally turned over to the State Highway Commission, February 17, 1909.

For canal purposes the Western Division comprises that part of the canal system of the state extending from the east line of Wayne county to the westerly line of Main street, in the city of Buffalo, covering a total of 147.88 miles of navigable waters. For Barge canal purposes the division is practically the same as the canal division, excepting that the work terminates at the Niagara river at Tonawanda. No construction work is necessary in the Niagara river between Tonawanda and Buffalo.

Coöperation has been extended and assistance given to the Department of Public Works in making surveys, plans and estimates; also appropriation maps, whenever requested.

Surveys and maps have been made and testimony given on behalf of the State in the Court of Claims and in suits brought against the State for damages resulting from leaks and breaks in the canal.

Surveys have been made for a new bridge to be constructed at Georgia street, in the city of Buffalo, chapter 452, Laws of 1909: also for a boat landing and pier at Dresden, chapter 266, Laws of 1908, and for a light-house at Keuka lake outlet, chapter 266, Laws of 1908.

The lift bridge at Lyell avenue, Rochester, has been completed, leaving only one contract pending, namely, the Allen street bridge at Rochester.

The details of contracts completed and in force are herewith appended:

CONTRACT COMPLETED DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1909.

LYELL AVENUE BRIDGE, ROCHESTER.

(Chapter 287, Laws of 1908.)

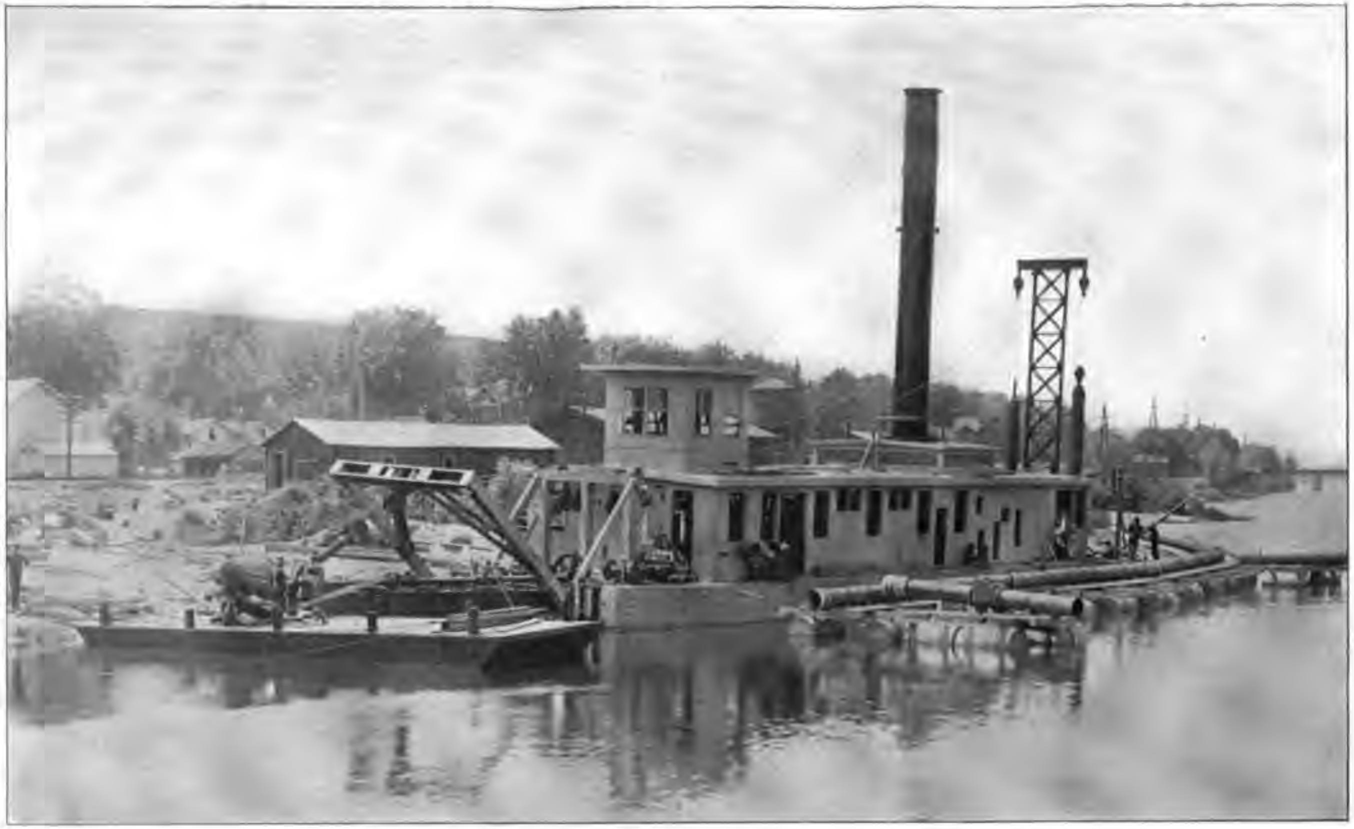
Contract dated, December 3, 1908.
Contract to be completed, May 1, 1909.
Contractor, W. J. Burns Co., Syracuse, N. Y.

Total appropriation	$50,000 00
Engineer's estimate	35,930 00
Contract price	30,970 40
Final estimate	31,336 64

This is a bascule bridge, constructed over the existing Erie canal at Lyell avenue, in the city of Rochester. The plans contemplating the construction of this structure were adopted November 17, 1908, by the Canal Board.

This is a skew bridge, making an angle of 60 degrees with the center line of the canal. The bridge has two main plate girders 79 ft. 3¾ in. in length, with a clear roadway of 38 feet and plank sidewalks 8 feet in width on either side of the bridge. The clear span between abutments is 45 feet.

The bridge is counterweighted with a reinforced concrete counterweight placed in a pit below the level of the street at the east end of the bridge, thus leaving the street clear of all obstructions. The pavement on the bridge proper is constructed of hard maple strips three inches in width, placed on edge and bolted together to form slabs and treated with a wood preservative.



Barge Canal, Contract No. 47.
View of the hydraulic dredge *Clyde* in process of construction.

This bridge is operated by two 25-horse-power, direct current motors, which, together with the machinery, are set on the counterweight, moving with it.'

The old foot-bridge was cut off on the west end and moved to a new position just south of the new bridge.

Work was commenced on this bridge December 17, 1908, and completed July 17, 1909. The bridge has worked successfully and is giving complete satisfaction.

CONTRACT PENDING SEPTEMBER 30, 1909.

CONSTRUCTING A LIFT BRIDGE AT ALLEN STREET, ROCHESTER.

(Chapter 291, Laws of 1908.)

Contract dated, January 15, 1909.
Contract to be completed, June 1, 1909.
Contractor, Wm. T. McKibben Company.

Appropriation	$50,000 00
Engineer's estimate	35,503 00
Contract price	26,708 40
Payments to September 30, 1909	17,482 50

Plans for this bridge were adopted by the Canal Board October 21, 1908, and call for the construction of a bascule bridge, with plate girders 69 feet long and having a clear roadway 36 feet wide and plank sidewalks 8 feet wide and a span of 48 feet between abutments.

Work was started January 18, 1909, but owing to delays in obtaining steel, machinery, etc., but 80 per cent of the work was completed on October 1, 1909.

BARGE CANAL.

Chapter 147, Laws of 1903.

For the purpose of carrying on the Barge canal work, the Western Division is divided into the following residencies:

Erie Canal Residency No. 8. From the easterly line of Wayne county, at the southeast corner of the town of Galen, to the westerly line of Wayne county, one-half mile west of the village of Waynesport, Wayne county. B. E. Failing, Resident Engineer, in charge, with office at Lyons.

Erie Canal Residency No. 9-A. From the westerly line of Wayne county to the Genesee river, following the route of the present Erie canal to Kings Bend, near Pittsford, and thence by a land line to the Genesee river. O. F. Bellows, Resident Engineer, in charge, with office at Rochester.

Erie Canal Residency No. 9-B. By way of a land line from the Genesee river, south of Rochester, to South Greece, thence along the present Erie canal to the westerly line of Monroe county, about 3 miles west of the village of Brockport. Thomas J. Morrison, Resident Engineer, in charge, with office at Rochester.

Erie Canal Residency No. 10-A. From the westerly line of Monroe county to a point 100 feet east of Gasport bridge, in the village of Gasport, Niagara county. Charles A. Ingersoll, Resident Engineer, in charge, with office at Medina.

Erie Canal Residency No. 10-B. From a point 100 feet east of Gasport bridge to the head of the present guard-lock near the village of Pendleton, Niagara county.

Erie Canal Residency No. 11. From the head of the guard-lock near the village of Pendleton, Niagara county, to the Niagara river at Tonawanda, to and through the city of Buffalo, Erie county. C. J. McDonough, First Assistant Engineer, in charge of residencies 10-B and 11, with office at North Tonawanda.

The reports of the several Resident Engineers on the work done during the fiscal year ended September 30, 1909, on their respective residencies, follow:

ERIE CANAL, RESIDENCY NO. 8.

Resident Engineer B. E. Failing reports:

"This residency extends from the easterly line of Wayne county, at the southeast corner of the town of Galen, to the westerly line of Wayne county one-half mile west of the village of Wayneport, Wayne county.

"In the fall of 1908 all preliminary work and contract plans for the low-level route of the canal through this residency were finished. On this route the residency was divided into three contracts — Nos. 47, 48 and 49,— two of them being as follows:

BARGE CANAL, CONTRACT No. 47.
View near the eastern end of the contract, showing a portion of the channel excavated by the hydraulic dredge *Clyde*.

"Contract No. 47 extends from the southeast corner of the town of Galen to a point near the New York Central railway crossing, at Lyons.

"Contract No. 48 extended from Lyons to about two miles east of Palmyra. The route followed the present river channel through Lyons and the valley north of Newark and East Palmyra.

"The route of contract No. 48 was found to be very expensive, on account of the rock west of East Palmyra and because a number of railroad crossings and changes were required. In August, 1909, the route of contract No. 48 was changed for its entire length, about 15 miles. The route adopted passes through the southern part of Lyons, through Newark along the line of the Erie canal and follows the valley through Port Gibson to Palmyra, remaining south of the West Shore and New York Central railways for the entire length of the contract. This change shortens the route by 1½ miles.

"The construction work on this residency has now been divided into five contracts, namely, Nos. 47, 48, 76, 77 and 49, with the following extents:

"Contract No. 48 extends from Creager's bridge to Lyons.

"Contract No. 76 extends from Lyons to Port Gibson.

"Contract No. 77 extends from Port Gibson to a point one mile west of Palmyra.

"Contract No. 49 extends from a point one mile west of Palmyra to the Wayne-Monroe county line.

"*Work done in residency office.* Maps, plans and estimates have been made on the alternative route of contract No. 48 and the contract drawings are about 90 per cent finished.

"The contract plans for contract No. 49 have been entirely finished.

"Preliminary work on contract No. 77 is about 90 per cent finished.

"Preliminary work on contract No. 76 is about 25 per cent finished.

"*Field work.* The field work has consisted of making a topographic survey of the new route of contract No. 48; running center line and taking cross-sections. All field work is completed on contracts Nos. 48, 49 and 77 and about 50 per cent of the field work is completed on contract No. 76.

"*Borings.* Borings have been completed on contracts Nos. 48, 49 and 77.

"On contract No. 76 about 25 per cent of the borings have been taken.

"It is expected that the preliminary field and office work will be finished in November, 1909.

"*Construction work. Contract No. 47.* Up to the present time only one contract on this residency has been placed under construction, viz., contract 47 is for the construction of the Barge canal from the southeast corner of the town of Galen to a point near the New York Central railway crossing at Lyons; length, 14.46 miles.

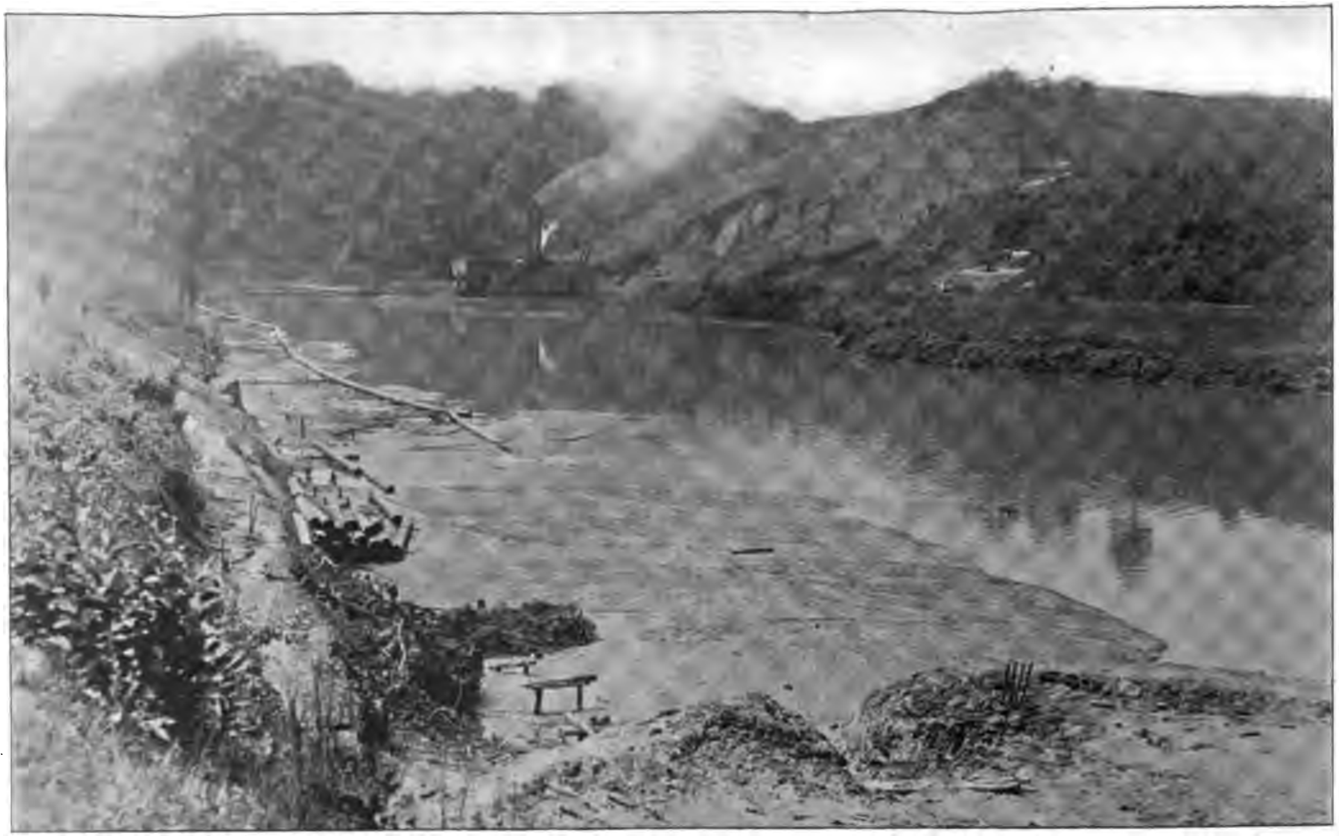
"This contract was let November 30, 1908, to the Crowell, Sherman, Stalter Company, of Cleveland, Ohio. Work on the contract was started in March, 1909, and has consisted chiefly in clearing and excavating.

"This contract is essentially a hydraulic dredging contract. A 20-inch Bucyrus suction dredge was installed and assembled at Clyde, which point is at about the middle of the contract. Actual dredging operations were begun with the dredge on June 28, in the river at Clyde, working in three shifts; the object of starting at this point being to dig a channel deep enough to float the dredge and also for obtaining coal and supplies to deep water below.

"Hard material was encountered here, consisting of gravel, clay and soft shale. This material was found to be too hard to dredge without racking the machinery and a temporary dam was constructed in the river three miles below to obtain sufficient water to float the dredge over the bars.

"The dredge was then moved down to Sta. 5886 and started in the land cut, known as the 'Heit' cut July 19. The prism was cleaned up entirely to Sta. 6871 + 60 on July 31, removing about 126,000 cubic yards in 13 days, of which the greater part was 'paid' material. The dredging work which the dredge was able to do east of Clyde to the county line has been finished.

"There were 172 days from the time the dredge began work until it was tied up for the winter. 18 days were lost in moving and repairing, making 154 actual working days. During



Barge Canal, Contract No. 41.
View of embankment being formed by hydraulic dredge at the Irondequoit creek crossing.

this time 1,181,500 cubic yards of material was excavated, which included about 166,000 cubic yards of heavy gravel. Of this amount 1,037,605 cubic yards was paid material, so that the material paid for was about 12 per cent under the actual amount removed. The average excavation per working day for the season was 7,668 cubic yards, and about 3½ miles of canal were completed.

" Work on this contract is about 10 per cent completed and is up to the schedule of time for completion.

"Appropriation surveys and maps have been made and all but five parcels have been appropriated on this contract.

" The following table shows the status of the work at the present time and shows the progress during the past year:

ITEMS OF WORK	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent or work done during year.	Per cent of work done to date.
Clearing....................acres	225	131	131	58.2	58.2
Excavation..................cu. yds.	5,310,800	575,437	575,437	10.8	10.8
Foundation piles..............lin. ft.	4,500	43	43	1.0	1.0
15-in vitrified pipe, laid.........lin. ft.	865	786	786	91.4	91.4
Trench'g and backfil'g for same..lin. ft.	865	786	786	91.4	91.4
Gross estimate....................	$1,273,071 35	$118,503 61	$118,503 61	9.3	9.3

ERIE CANAL, RESIDENCY NO. 9.

Prior to April 1, 1909, Residency No. 9 extended from the east line of Monroe county to the west line of the county, a distance of about 40 miles. This entire residency was under the charge of Thomas J. Morrison, Resident Engineer, up to April 1, 1909, when the residency was subdivided at the Genesee river, that part east of the Genesee river being designated as " Residency 9-A," O. F. Bellows, Resident Engineer, being placed in charge, while the portion west of the river was called " Residency No. 9-B," of which Thomas J. Morrison, Resident Engineer is in charge.

ERIE CANAL, RESIDENCY NO. 9-A.

Resident Engineers Bellows and Morrison report on Residency No. 9-A as follows:

" This residency, extending from the westerly line of Wayne county to the Genesee river, following the route of the present

Erie canal to Kings Bend, near Pittsford, and thence by a land line to the Genesee river.

"*Preliminary Surveys.*

"*Contract No.* 63. Preliminary surveys, borings and soundings were made under the direction of Assistant Engineer George C. Mills, and the base line of survey monumented. The old blue lines of the canal were resurveyed and partially staked out. Contract drawings, with the exception of structures, were prepared, together with preliminary estimate of prism quantities. Lay-out plans of structures were prepared and forwarded to Albany.

"The original blue line and the 'nine million' blue line have been located and marked with gas pipe monuments; the center line has been partially run by off-set lines; surveys and comparative studies were made for the relocation of the spillway at Fairport; surveys and rock soundings have been made at bridge locations in and near Fairport; also detailed information furnished when requested by the Division Engineer's office.

"*Contract No.* 23. Appropriation surveys have been made, field notes sent to the Division Engineer's office for the preparation of appropriation maps, and center line run and monumented.

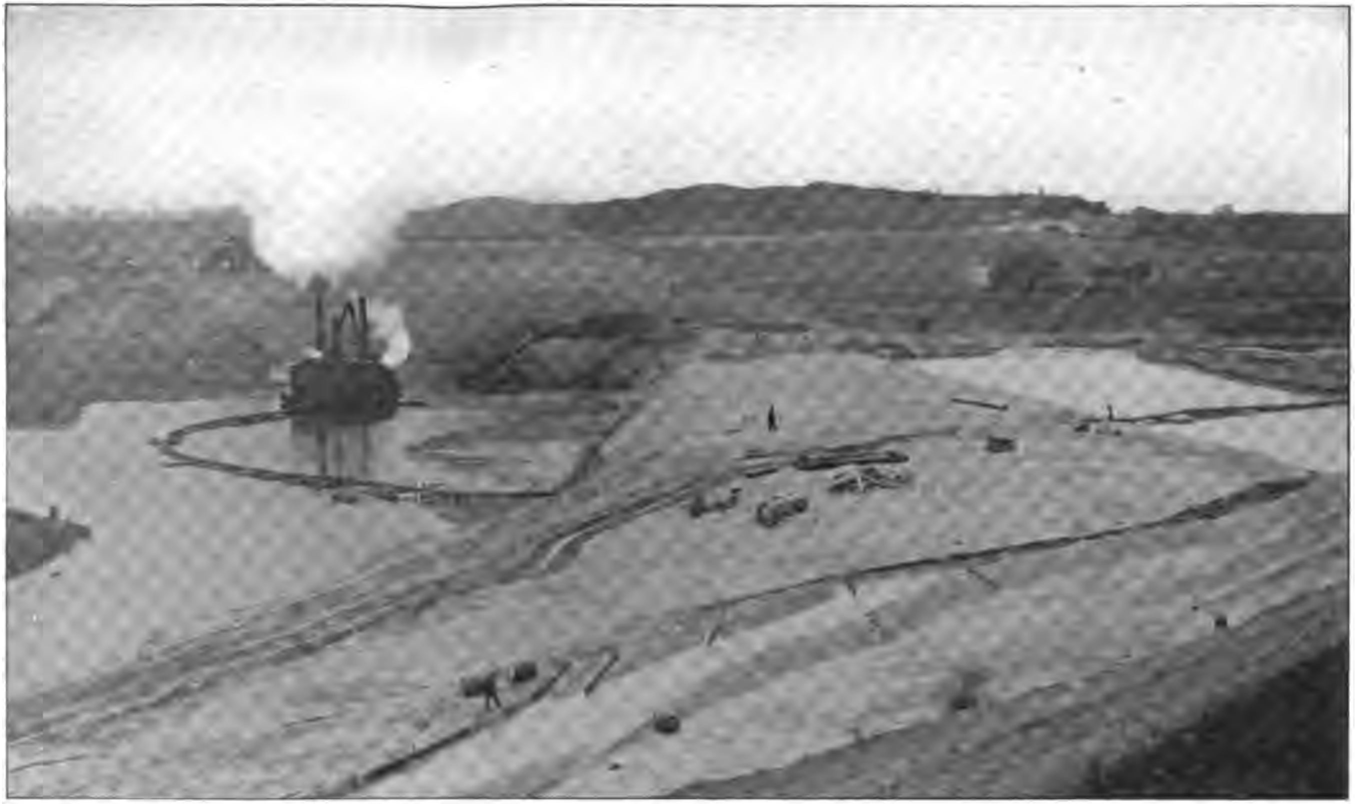
"*Construction Work.*

"Three contracts are under construction on this residency, with work done as follows:

"*Contract No.* 38. This contract provides for the construction of superstructure and substructure and approaches for a highway bridge at Wappings, 2.5 miles west of Fairport, Sta. 2003 + 51; Henry Tosh and Son, of Port Gibson, N. Y., contractors; H. R. Wickham, Assistant Engineer, in charge. Amount of contract, $17,157.50.

"This contract was completed the early part of August, 1909, the final estimate showing the total value of work done, including alteration No. 1, as $16,286.67.

"This contract stipulated that the material for forming the bridge approaches should be taken from the canal prism, the excavation being made to the grade and slope lines contemplated for the adjacent contract, No. 63.



Barge Canal, Contract No. 41.
General view of embankment formed by hydraulic dredge at the Irondequoit creek crossing.

" Excavation was done with drag and wheel scrapers until the old canal bed became too soft for team work, when a one-yard bucket excavator, manufactured by the Doby Foundry and Machine Co., was used in connection with dump cars.

" A detailed table for this contract follows:

ITEMS OF WORK.	Prelimi-nary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing and draining ....lump sum	$200	$200	$200	100	100
Excavation..........................cu. yds.	12,788	12,835	12,835	100	100
Lining..............................cu. yds.	900	846.5	846.5	100	100
Sawed lumber......................ft. B. M.	2,500	1,986	1,986	100	100
Second-class concrete..............cu. yds.	250	212.5	212.5	100	100
Third-class concrete...............cu. yds.	26.6	13.7	13.7	100	100
Reinforced concrete................cu. yds.	90.2	89.2	89.2	100	100
First-class masonry coping..........cu. yds.	2	1.65	1.65	100	100
Third-class stone paving............sq. yds.	266.5	240	240	100	100
Structural steel...........................lbs.	105,000	103,127	103,127	100	100
Metal reinforcement......................lbs.	8,755	8,306	8,306	100	100
Wooden pavement...................sq. yds.	275	263.6	263.6	100	100
Wooden fence.........................lin. ft.	1,500	1,575	1,575	100	100
Gross estimate............................	$16,869 90	$16,286 67	$16,286 67	100	100

" *Contract No.* 41. For the building of embankments, Irondequoit creek crossing; length of contract, about 0.8 mile. Butler Brothers Construction Company, of New York city, contractors; L. G. Fisher, Assistant Engineer, in charge. Amount of contract, $281,330. Work done to October 1, 1909, $90,410.

" One 70-ton Bucyrus steam-shovel, three standard gage 24 to 30-ton locomotives, 6-yard dump cars and pipe line with water jets, also a hydraulic dredge with 12-inch suction and discharge pipes were installed on this contract for doing the work.

" The embankments on this contract are made of pure sand, either deposited from dump cars and the material jetted away from the tracks by water-jets, or else pumped to the embankment site by hydraulic dredge.

" The following table gives the status of the work at the present time and shows the progress during the past year:

ITEMS OF WOR	Prelimi-nary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.........................lump sum	$250	$120	$120	48	48
Grubbing...........................cu. yds.	19,000	13,748	13,748	72.4	72.4
Excavation.........................cu. yds.	1,072,000	336,304	336,304	31.4	31.4
Embankment......................cu. yds.	865,000	304,618	304,618	35.2	35.2
Gross estimate............................	$281,730	$90,416	$90,416	32.1	32.1

"*Contract No.* 23. Provides for the construction of the land line from Kings Bend to the Genesee river, a distance of 5.63 miles. Millard & Lupton Co., Philadelphia, Pa., contractors. Frank T. Marsh, Assistant Engineer, in charge. Amount of contract, $1,887,036.

"This contract was signed on August 18, 1909, and up to September 30 the contractors had done no contract work, but had assembled a considerable part of their plant, consisting of three 70-ton Bucyrus steam-shovels, eight 12 to 18-ton narrow gage locomotives, 4-yard dump cars, drag and wheel scrapers, wagons, carts, etc."

Erie Canal, Residency No. 9-B.

Resident Engineer, Thomas J. Morrison, reports as follows:

"This residency extends by way of the land line from the Genesee river south of Rochester to South Greece, thence along the present Erie canal to the westerly line of Monroe county, about 3 miles west of the village of Brockport.

"The residency embraces the following contract sections:

"Contract No. 21, from the Genesee river to the New York Central railroad crossing near Lincoln Park, a distance of 2.45 miles.

"Contract No. 6, from the New York Central railroad crossing to about one mile east of South Greece, a distance of 3.28 miles.

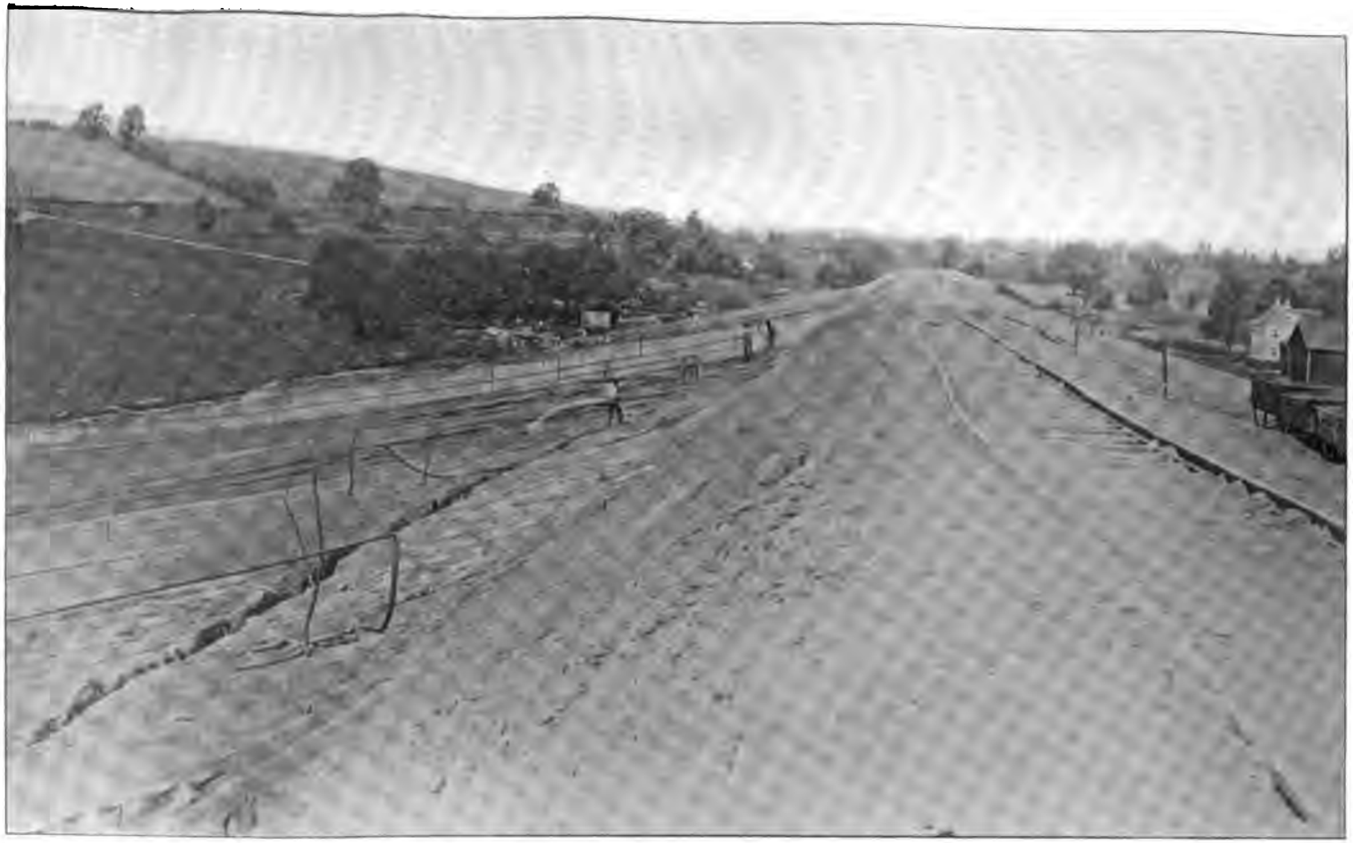
"Contract No. 60, from the west end of contract No. 6 to about one-half mile west of Adams Basin bridge, a distance of 8.53 miles.

"Contract No. 61, from the west end of contract No. 60 to the west line of Monroe county, a distance of 7.39 miles.

"*Contract No.* 21. Surveys of land required for spoil banks have been made, together with appropriation surveys of some of the land to be taken.

"*Contract No.* 6. F. A. Maselli is contractor for this work, with H. J. Hemstreet, Assistant Engineer, in charge. Fairly good progress has been made during the year.

"Steam-shovel No. 1, with train outfit, worked from Sta. 2571 to Sta. 2590, to December 29, 1908, when it was taken out of the cut.



Barge Canal, Contract No. 41.
Embankment made by steam-shovel and car plant and spread by means of water jets.

"The bridge conveyor worked from Sta. 2648 east to Sta. 2590 + 50, taking out center cut down to grade. In June, 1909, it moved back to Sta. 2645 + 50 and started there working east, finishing canal prism full width and depth. The slopes were dressed down by hand ahead of the conveyor. This work has been carried east to Sta. 2614, making a completed canal section from Sta. 2614 to Sta. 2645 + 50.

"Four channelers worked in conjunction with the conveyor, cutting down the rock sides from above the proposed water surface to grade. This work has been done from Sta. 2608 + 75 to Sta. 2651 + 50. Two additional channelers have been set up just west of the Falls road bridge (Sta. 2651 + 50) and have started to continue to the west the cuts made by the other channelers.

"In May, 1909, two steam-shovels with the necessary locomotives and cars started in at Sta. 2722 trimming down the rough sides and slopes left by the conveyor and tipple inclines. The slopes were trimmed by hand, the material being thrown down into the cut, where is was taken up by the shovels, loaded into cars and hauled out on the spoil banks at the west end of the contract. When rock was encountered that had not been shattered sufficiently by the former operations to be broken off by hand, it was drilled and blasted. This work has been carried on to the east to Sta. 2678, making a second completed section of prism from Sta. 2678 to Sta. 2722.

"The following table gives the quantity of material excavated by each unit of plant for each month of its operation:

MONTH.	MATERIAL EXCAVATED BY BRIDGE CONVEYOR.		MATERIAL EXCAVATED BY STEAM-SHOVEL NO. 1 AND TRAIN OUTFIT.		MATERIAL EXCAVATED BY STEAM-SHOVELS NOS. 1 AND 2 AND TRAIN OUTFITS.	
	Earth.	Rock.	Earth.	Rock.	Earth.	Rock.
	Cu. yds.	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*
October, 1908	0	21,475	0	13,569	0	0
November, 1908	0	21,922	0	8,968	0	0
December, 1908	12,317	10,944	0	4,101	0	0
January, 1909	6,617	21,421	0	0	0	0
February, 1909	0	17,624	0	0	0	0
March, 1909	0	19,142	0	0	0	0
April, 1909	0	21,254	0	0	0	0
May, 1909	0	27,007	0	0	2,680	5,441
June, 1909	3,615	19,387	0	0	13,600	420
July, 1909	0	33,850	0	0	0	8,817
August, 1909	0	24,398	0	0	0	7,583
September, 1909	0	27,778	0	0	0	12,472

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"The following is a table showing the quantity of channeling done and the number of shifts worked during each month of the year:

MONTH.	Square feet of channeled surface.	Number of 8-hour shifts worked.
October, 1908	2,582	44
November, 1908	2,282	48
December, 1908	3,942	75
January, 1909	4,522	82
February, 1909	5,795	95
March, 1909	9,962	80
April, 1909	16,541	175
May, 1909	15,149	168
June, 1909	13,402	183
July, 1909	10,525	197
August, 1909	6,673	180
September, 1909	8,162	204

"Progress on walls and structures has been as follows:

"Lyell road bridge, abutments completed and approaches graded.

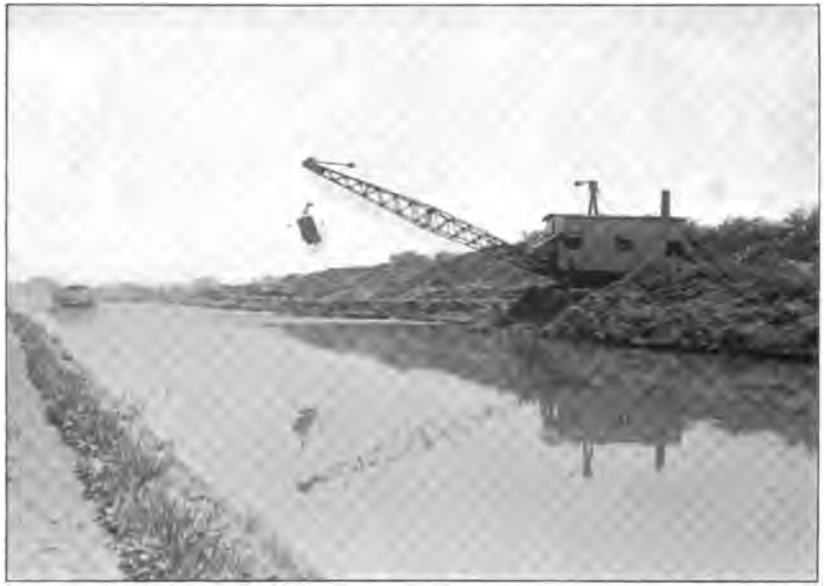
"Lee road bridge, abutments completed and backfill made.

"Spiers road bridge, approaches raised under an alteration plan.

"Concrete retaining walls, foundation courses laid from Sta. 2627 + 32 to Sta. 2629 + 30, north side of prism.

"Wash-wall, excavation for the wall partially made from Sta. 2725 to Sta. 2744, south side, and from Sta. 2725 to Sta. 2729, north side, material being used to raise embankments at the same stations.

"The Buffalo, Lockport and Rochester Electric railway have built a bridge at Sta. 2654 + 60 and are now operating cars over it.



BARGE CANAL, CONTRACT No. 61.
View showing a revolving excavator with scraper bucket, operating during the season of navigation.

"Following is a table showing the percentage of work done during the year and to date on this contract.

ITEMS OF WORK.	Total quantities as modified by alterations 1 to 7.	Work done during year	Total work done to date.	Per cent or work done during year.	Per cent of work done to date.
Clearing .... acres	27	....	21.6	....	80
Grubbing .... cu. yds.	4,500	....	3,711	....	82
Excavation .... cu. yds.	2,095,460	419,664	1,780,569	20	85
Channeling .... sq. ft.	228,840	99,537	99,991	40	44
Embankment .... cu. yds.	38,000	15,128	32,724	40	86
Puddle .... cu. yds.	1,700	....	....	....	....
White oak timber and plank .... ft. B. M.	500	....	....	....	....
Hemlock timber and plank .... ft. B. M.	500	....	....	....	....
Second-class concrete .... cu. yds.	1,757	1,140	1,461	65	83
Third-class concrete .... cu. yds.	300	....	264	....	88
First-class masonry coping .... cu. yds.	15	9.82	11.75	65	78
Wash-wall, including coping .... cu. yds.	9,990	....	....	....	....
Stone paving .... sq. yds.	60	....	....	....	....
Fencing .... lin. ft.	1,400	....	....	....	....
Macadam pavement .... sq. yds.	500	....	....	....	....

Total of all work done during the year = 18.6 per cent of estimate of cost.
Total of all work done to date = 82.9 per cent of estimate of cost.

"*Contract No. 7.* This contract covered the construction of the superstructures of the bridges on contract No. 6. During the year the superstructures of the Buffalo road, Lyell road and Lee road bridges were erected, thereby completing the work of this contract on the section covered by contract No. 6.

"*Contract No.* 60. Progress on the contract during the year by the Empire Engineering Corporation has been very good. The work at various times has been under the direction of Lewis G. Fisher, Jos. H. Young, Chas. L. Henderson and G. M. Briggs, Assistant Engineers.

"Appropriation surveys and maps for the entire right of way have been completed.

"The South Greece cut-off, made by steam-shovel No. 1 and train outfit, has been approximately 85 per cent finished during the past winter. The channeling through the rock cut has been finished and 85 per cent of the concrete retaining wall built. The wash-walls for the east end of the cut-off have been completed with the exception of the coping. The old canal at this point has been filled up with spoil and the new cut-off has been operated as a canal during the present season. A large portion of the good material was hauled to the east, forming the new south embankment almost as far east as Douglass farm bridge.

"Steam-shovel No. 2 worked in the Shafer borrow-pit at the west end of the contract, the material being used to form the south embankment from the west end of the contract to bridge No. 103, and the south approach to bridge No. 103. Later this plant was moved to the French borrow-pit, where material was taken out for the south approach to bridge No. 102. This borrow-pit was later given up and the steam-shovel moved to the east end of the contract, where it completed the cut-off connecting with contract No. 6 and the old canal. The material excavated was hauled west along the south side of the canal, completing the embankment on that side to South Greece.

"A ladder-dredge was built at Adams Basin during the past winter and spring and on July 30, 1909, it started work at the west end of the contract. This plant has moved east to Sta. 3353, depositing the material to form embankment on both sides. This machine has taken out during the few months it has been in operation from 20,000 to 32,000 cubic yards per month, working three eight-hour shiftts per day. Much difficulty has been met with in holding the wet material in embankment. At first very heavy wooden forms were constructed the full height of the embankment. These were expensive and inefficient in that they gave way in places, allowing the soft material to flow out over the adjoining land. The plan has now been adopted of building dikes of sod and earth about four feet high along the outside limits of the embankment. The material is deposited by the dredge within the dikes, the dredge moving along as soon as the material reaches the top of the dikes. When the bank has dried out a second series of dikes is built on top of the first and the dredge moved back to fill again.

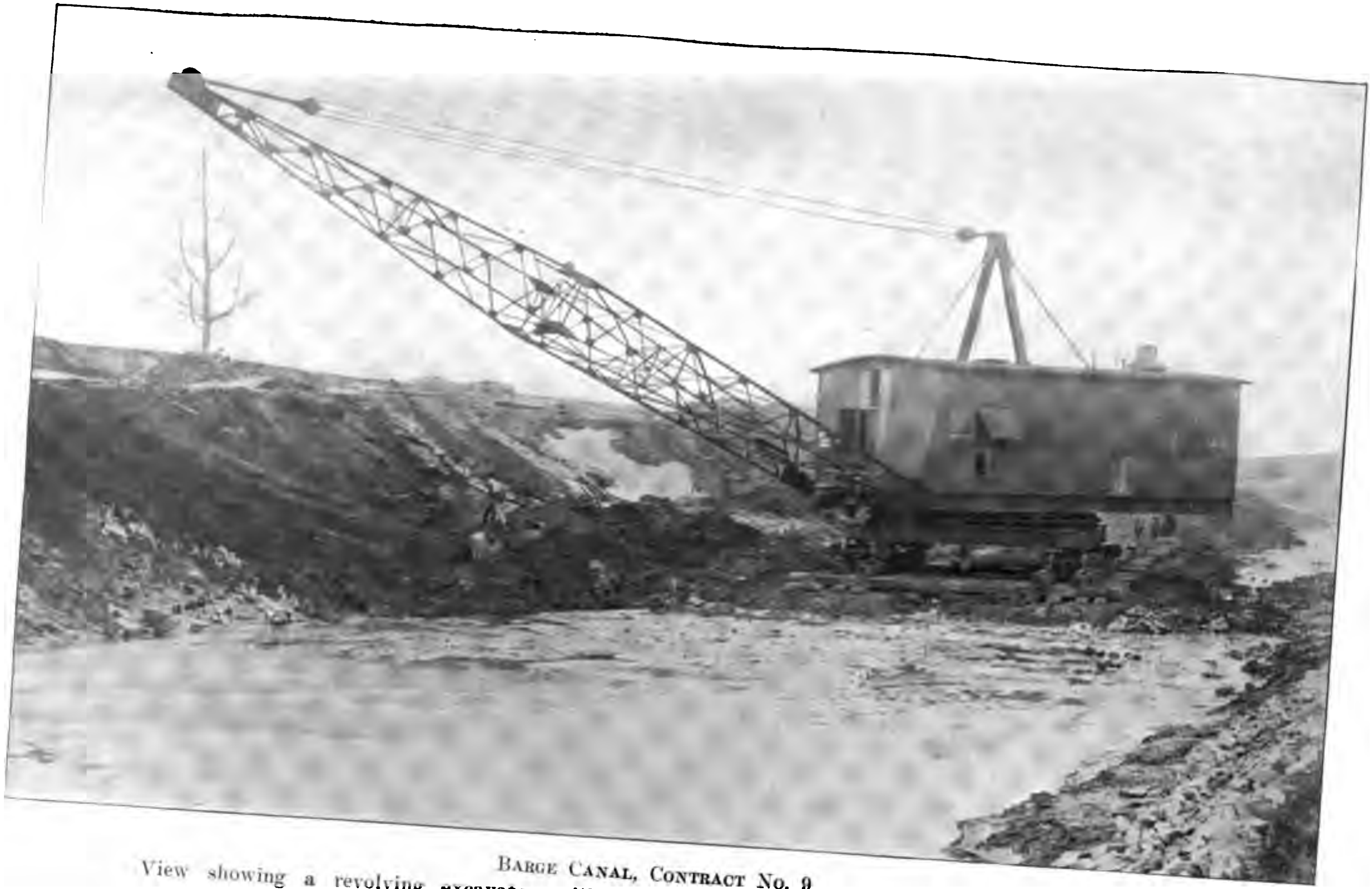
"Besides the work done by the large units described above, prism excavation and embankment has been built at a number of points by teams and scrapers, wagons and Koppel car outfits.

"Considerable wash-wall has been built at various places along the contract.

"A concrete retaining wall 312 feet long has been built on the north side in the village of Spencerport under an alteration to the original contract.

"Progress on the structures during the year is as follows:

"Culverts Nos. 44, 45, 46, 47, 48, 49, 50, 51, 52 and 54, completed, except some paving and surface finishing.



Barge Canal, Contract No. 9.

View showing a revolving excavator with scraper bucket, operating in the bottom of the prism.

"Bridges Nos. 94, 95, 96, 99, 100, 102 and 103, completed, except approaches. Approaches to bridge No. 94 are completed with the exception of a portion of the lining. This bridge has been opened to traffic. Approaches to the other bridges have been partly built.

"The South Greece waste-weir has been completed except the painting of the steel work. The Spencerport waste-weir has been completed with the exception of the tow-path bridge, backfill at ends and the paving of the outlet ditch. The Adams Basin waste-weir has been completed except the riprap protection of the outlet ditch.

"Following is a table showing the percentage of work done during the year and to date on this contract:

ITEMS OF WORK.	Total quantities as modified by alterations 1 to 3.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, etc .... miles	8.5	6	6	70.6	70.6
Clearing .... lump sum	1	0.07	0.59	7	59
Grubbing .... cu. yds.	47,807	17,100	18,964	35.8	39.7
Excavation .... cu. yds.	1,205,426	466,046	472,477	28.7	39.2
Sheeting and bracing .... ft. B. M.	43,000	24,104	24,643	56.1	57.3
Channeling .... sq. ft.	26,000	15,312	15,312	58.9	58.9
First-class embankment .... cu. yds.	738,123	201,567	203,649	27.3	27.6
Second-class embankment .... cu. yds.	191,630	70,268	70,268	36.7	36.7
Lining .... cu. yds.	25,950	2,806	2,806	10.8	10.8
Puddle .... cu. yds.	63,167	4,344	4,344	6.9	6.9
Sawed lumber, yellow pine or Douglas fir, .. ft. B. M.	24,000	19,056	19,056	79.4	79.4
Foundation piles .... lin. ft.	13,700	4,277	5,176	31.2	37.8
Wooden sheet-piling .... ft. B. M.	30,000	....	....	....	....
Second-class concrete .... cu. yds.	11,449	8,102	8,156	70.8	71.2
Third-class concrete .... cu. yds.	1,804	1,406	1,406	77.9	77.9
Reinforced concrete .... cu. yds.	1,580	1,526	1,526	96.6	96.6
First-class masonry coping .... cu. yds.	15	1.7	1.7	11.3	11.3
Wash-wall .... cu. yds.	66,960	8,679	8,679	13	13
Second-class stone paving .... sq. yds.	4,025	681	681	16.9	16.9
Third-class stone paving .... sq. yds.	1,860	212	212	11.4	11.4
Third-class riprap .... cu. yds.	559.4	....	....	....	....
Fourth-class riprap .... cu. yds.	100	31	31	31	31
Cast iron culvert pipe and specials .... lbs.	95,600	83,825	83,825	87.7	87.7
12-inch vitrified pipe, laid .... lin. ft.	20	20	20	100	100
Trenching, etc., 12-inch pipe .... lin. ft.	20	20	20	100	100
Structural steel .... lbs.	816,000	790,533	790,533	96.9	96.9
Metal reinforcement .... lbs.	100,440	89,876	89,876	89.5	89.5
Wooden pavement, 2¾" thick .... sq. yds.	1,330	1,304.2	1,304.2	98.1	98.1
Wooden pavement, 3¼" thick .... sq. yds.	650	622.1	622.1	95.7	95.7
Wooden fence .... lin. ft.	16,591	2,220	2,220	13.4	13.4
Wrought iron pipe railing .... lin. ft.	205	....	....	....	....
Lattice railing .... lin. ft.	410	398	398	97.1	97.1
Sluice-gate valves, 36" x 40" .... No.	7	6	6	85.7	85.7
Sluice-gate valves, 33" x 33" .... No.	2	1	1	50	50
Repointing old masonry .... lin. ft.	1,000	....	....	....	....
Maintaining navigation .... lump sum	1	36.6%	36.6%	36.6	36.6
Maintaining highway traffic .... lump sum	1	42.8%	42.8%	42.8	42.8
36" vitrified tile pipe, laid with cement joints, lin. ft.	244	....	....	....	....

Total of all work done during the year is 36.8 per cent of estimate.
Total of all work done to date is 37.3 per cent of estimate of cost.

"*Contract No.* 61. This contract was let to E. M. Graves, of Cleveland, Ohio, October 13, 1908, and assigned to Cleveland & Sons Co., of Brockport, N. Y., December 1, 1908. Assistant Engineer A. S. Millinowski has been in local charge, with headquarters at Brockport.

"Appropriation surveys have been completed.

"Work was begun on November 21, 1908, in the vicinity of bridge No. 110.

"Two Lidgerwood-Crawford excavators, equipped with Page buckets, have been installed. No. 1 has worked on the south side from Sta. 3467 to Sta. 3488, spoiling the material removed. No. 2 has worked on the north side from Sta. 3506 to Sta. 3514 + 50, placing the excavated material in the north embankment.

"Besides the work done by these two plants, considerable excavation and embankment has been made at various points by teams and scrapers.

"Considerable wash-wall has been built on both sides from Brockport to the east end of the contract.

"About 462 linear feet of concrete retaining wall through the village of Brockport has been built.

"The following progress has been made on structures:

"Culverts Nos. 55½, 56 and 57, both extensions completed, except paving.

"Culvert No. 58, north extension completed, except paving.

"Culvert No. 59, south extension completed, except paving, cut-off wall and backfill.

"Bridge No. 104, south approach partially made; culvert built under north approach.

"Bridge No. 106, both abutments finished and approaches partly made.

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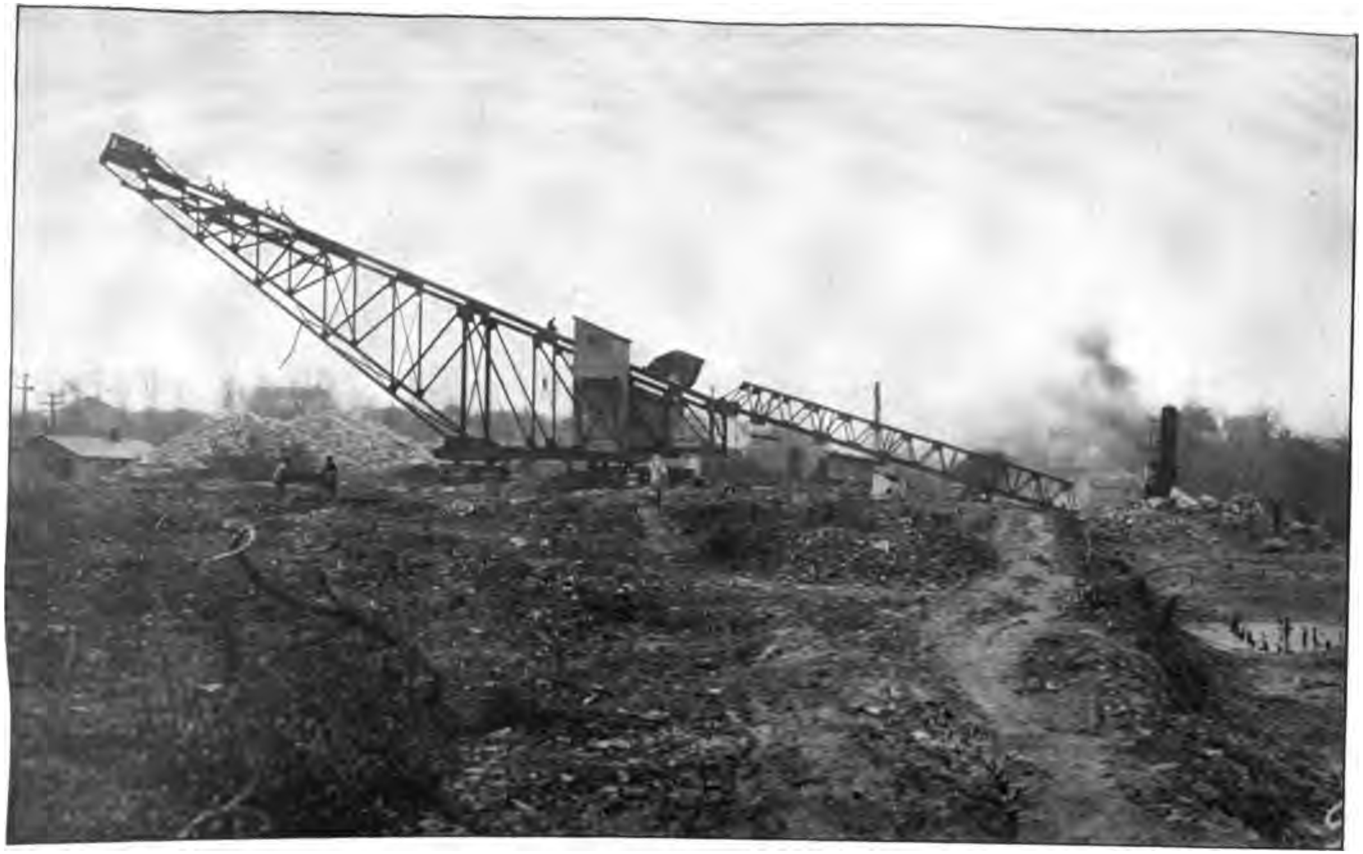


Barge Canal, Contract No. 40.
View of an excavating unit, consisting of steam-shovel and tipple, at work near Lockport.

" Following is a table showing the percentage of work done during the year and to date on this contract:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, etc. ....miles	7.4	....	....	....	....
Clearing..........................lump sum	1	0.3	0.3	30	30
Grubbing..........................cu. yds.	48,500	6,354	6,354	13.1	13.1
Excavation........................cu. yds.	947,500	92,245	92,245	9.7	9.7
Sheeting and bracing...............ft. B. M.	20,000	4,560	4,560	22.8	22.8
Embankment, first-class............cu. yds.	564,000	31,405	31,405	5.6	5.6
Embankment, second-class..........cu. yds.	96,000	7,229	7,229	7.5	7.5
Lining............................cu. yds.	18,900	....	....	....	....
Puddle............................cu. yds.	13,900	....	....	....	....
Sawed lumber, yellow pine or Douglas fir, ...ft. B. M.	11,000	320	320	2.9	2.9
Foundation piles....................lin. ft.	3,400	....	....	....	....
Wooden sheet-piling................ft. B. M.	5,000	....	....	....	....
First-class concrete................cu. yds.	65	....	....	....	....
Second-class concrete..............cu. yds.	9,720	1,154	1,154	11.9	11.9
Third-class concrete...............cu. yds.	1,030	189	189	18.4	18.4
Reinforced concrete................cu. yds.	350	76	76	21.7	21.7
First-class masonry coping..........cu. yds.	8	....	....	....	....
Dry retaining wall, with coping.......cu. yds.	1,500	....	....	....	....
Wash-wall.........................cu. yds.	63,700	2,531	2,531	4	4
Second-class stone paving...........sq. yds.	350	....	....	....	....
Third-class stone paving............sq. yds.	1,200	....	....	....	....
Cobblestone paving.................sq. yds.	275	....	....	....	....
Third-class riprap..................sq. yds.	280	....	....	....	....
Cast iron pipe and specials.............lbs.	39,800	....	....	....	....
12-in. vitrified pipe, laid..............lin. ft.	148	124	124	83.8	83.8
24-inch vitrified pipe, laid............lin. ft.	110	....	....	....	....
Structural steel........................lbs.	443,600	746	746	0.2	0.2
Metal reinforcement....................lbs.	43,000	8,835	8,835	20.5	20.5
Wooden pavement, 2¼" thick, ...sq. yds.	820	....	....	....	....
Wooden pavement, 3¼" thick........sq. yds.	220	....	....	....	....
Wooden fence.......................lin. ft.	8,500	....	....	....	....
Wrought iron pipe rail...............lin. ft.	660	....	....	....	....
Lattice railing.......................lin. ft.	330	....	....	....	....
Gates, standards and operat. machinery...No.	3	....	....	....	....
Relaying board walks.................sq. ft.	900	....	....	....	....
Repointing old masonry..............lin. ft.	1,000	....	....	....	....
Drilling bolt holes, old masonry........lin. ft.	1,400	218	218	15.6	15.6
Maintaining navigation............lump sum	1	....	....	....	....
Maintaining highway traffic........lump sum	1	....	....	....	....

Total of all work done during year is 7.75 per cent of estimate of cost.
Total of all work done to date is 7.75 per cent of estimate of cost.

" Daily readings have been taken of the gages on the Genesee river, one on the Elmwood avenue bridge, Rochester, and the other on Ballantines bridge."

ERIE CANAL, RESIDENCY NO. 10-A.

Resident Engineer, Charles A. Ingersoll, reports as follows:

" This residency embraces contracts Nos. 62, 9, 65 and 64. Of these contracts but two, namely, Nos. 9 and 64, are under construction.

" The residency extends from the westerly line of Monroe county to a point 100 feet east of Gasport bridge, in the village of Gasport, Niagara county.

"*Preliminary Work.*

" The preliminary work on this residency has consisted principally of appropriation surveys and the preparation of appropriation maps for contracts Nos. 9 and 64. About 90 per cent of this work has been completed.

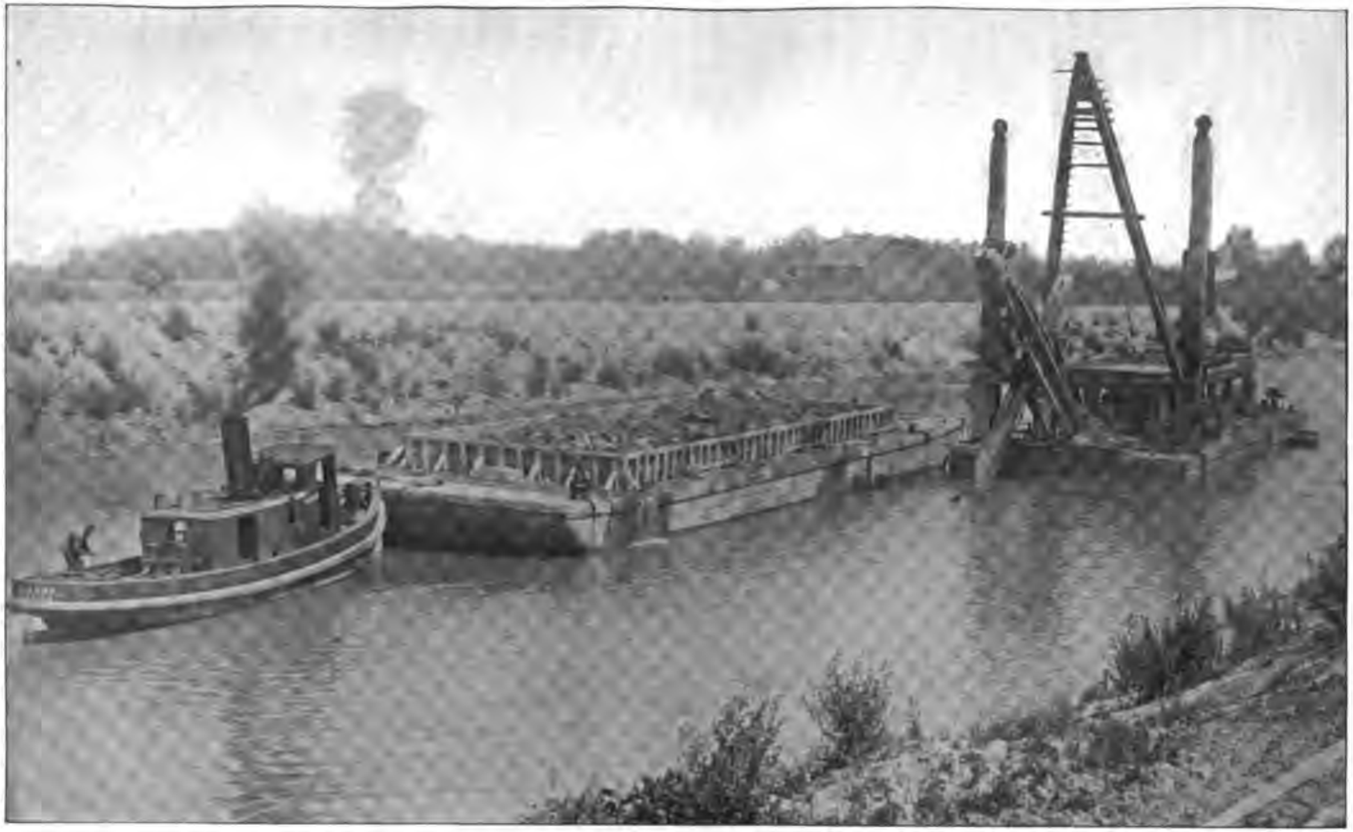
" Reappraisals of appropriated lands and buildings have been made on the above contracts and various investigations and reports pertaining to the preparation of plans, etc., relating to contracts Nos. 62 and 65 have been made.

" Tests of bearing power of the 'red horse' in Oak Orchard gorge, at the site of the proposed aqueduct, are being made.

" *Construction Work.*

" Two contracts are under construction on this residency with work done as follows:

" *Contract No.* 9 provides for the improvement of the present Erie canal from a point 0.164 mile east of Eagle Harbor to a point 0.09 mile west of Beal's bridge; length 5.682 miles. Thomas Crimmins Contracting Company, of New York city, contractors. Arthur S. Whitbeck, Assistant Engineer, in charge. Amount of contract, $755,995. Work done to October 1, 1909, $328,980. General equipment — two Lidgerwood excavators, locomotives and dump cars, teams, scrapers and wagons; derricks at all structures.



Barge Canal, Contract No. 19.
Dipper-dredge excavating near Pendleton and loading into scow.

" The following table shows the relative amounts of work done on this contract:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing.........................lump sum	$1,800	$180	$1,620	10	90
Grubbing...........................cu. yds.	40,370	8,744	16,644	21.6	41.2
All excavation.....................cu. yds.	752,890	238,715	323,821	31.7	43
Sheeting and bracing...............ft. B. M.	50,000	8,271	13,772	16.5	27.5
Embankment.........................cu. yds.	446,164	128,118	173,712	28.7	39
Lining.............................cu. yds.	162,119	2,863	2,863	1.8	1.8
Puddle.............................cu. yds.	4,000	389	389	9.7	9.7
Sawed lumber.......................ft. B. M.	70,000	27,369	27,369	39.1	39.1
Foundation piles...................lin. ft.	33,190	....	2,434	....	7.3
Second-class concrete..............cu. yds.	4,240	1,445	1,878	34.1	44.3
Third-class concrete...............cu. yds.	4,090	2,634	2,875	64.4	70.3
Reinforced concrete................cu. yds.	470	42	202	9	43
First-class masonry................cu. yds.	190	125	154	65.8	81
First-class masonry backing........cu. yds.	110	69	92	62.7	83.6
First-class masonry coping.........cu. yds.	30	19	19	63.3	63.3
First-class masonry ringstones.....cu. yds.	8	56	56	70	70
First-class masonry sheeting.......cu. yds.	70	45.6	45.6	65.1	65.1
Washwall...........................cu. yds.	41,585	18,165	18,165	43.7	43.7
Second-class paving................sq. yds.	300	73	73	24.3	24.3
Third-class paving.................sq. yds.	1,873	87	135	1	7.2
Third-class riprap.................sq. yds.	310	159	159	51.3	51.3
Cast iron culvert pipe and specials........lbs.	927,000	651,391	668,005	70	72.1
8-inch vitrified pipe laid.........lin. ft.	60	45	45	75	75
15-inch vitrified pipe laid........lin. ft.	60	45	45	75	75
Trenching and backfilling for 8-inch pipe.lin. ft.	60	45	45	75	75
Trenching and backfilling for 15-in. pipe.lin. ft.	60	45	45	75	75
Structural steel...................lbs.	690,065	311,388	311,388	45.1	45.1
Metal reinforcement................lbs.	47,600	3,946	20,560	8.3	43.2
Wooden fence.......................lin. ft.	8,585	1,568	1,568	18.4	18.4
Wrought iron pipe rail.............lin. ft.	280	18	18	6.4	6.4
Resetting catch basin covers.......No.	2	2	2	100	100
Maintaining navigation ....lump sum	$8,000	$6,000	$6,000	75	75
Maintaining highway traffic........lump sum	$2,500	$1,250	$1,250	50	50
Drilling bolt holes in old masonry......lin. ft.	29	28	28	96.5	96.5
Gross estimate........................	$761,952 38	$264,388 53	$328,987 79	34.7	43.2

" *Contract No.* 64 provides for the improvement of the present Erie canal from a point 600 feet west of Prospect street bridge, Medina, to a point 100 feet east of Gasport bridge; length 9.91 miles, Empire Engineering Corporation, of New York city, contractors. R. H. Merrill, Assistant Engineer, in charge, with office at Middleport. Amount of contract, $1,290,492. Work done to October 1, 1909, $221,950. General equipment — teams, scrapers, wagons, Koppel cars, two travelling derricks, one steam-shovel.

"The following table shows the relative amounts of work done on this contract:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, bailing, pumping, etc. . . . miles	10	4	4	40	40
Clearing . . . . lump sum	$2,600	$2,210	$2,210	85	85
Grubbing . . . . cu. yds.	55,200	9,897	9,897	18	18
Excavation . . . . cu. yds.	1,109,113	148,687	148,687	13.4	13.4
First-class embankment . . . . cu. yds.	412,261	72,008	72,008	17.4	17.4
Second-class embankment . . . . cu. yds.	117,000	40,881	40,881	34.9	34.9
Lining . . . . cu. yds.	26,000	343	343	1.3	1.3
Sawed lumber . . . . ft. B. M.	25,000	5,408	5,408	21.6	21.6
Foundation piles . . . . lin. ft.	3,500	1,660	1,660	47.5	47.5
Second-class concrete . . . . cu. yds.	16,280	5,661	5,661	34.8	34.8
Third-class concrete . . . . cu. yds.	2,782	1,399	1,399	50.3	50.3
Reinforced concrete . . . . cu. yds.	720	367	367	51	51
Wash-wall . . . . cu. yds.	69,400	2,461	2,461	35.5	35.5
Second-class stone paving . . . . sq. yds.	1,400	77	77	5.5	5.5
Cast iron pipe and specials . . . . lbs.	840,000	459,066	459,066	54.6	54.6
Structural steel . . . . lbs.	955,400	149,215	149,215	15.6	15.6
Metal reinforcement . . . . lbs.	64,000	33,050	33,050	51.6	51.6
Sluice-gate valves . . . . No.	5	3	3	60	60
Maintaining navigation . . . . lump sum	$13,000	$3,900	$3,900	30	30
Gross estimate	$1,293,230 12	$221,953 61	$221,953 61	17.2	17.2

ERIE CANAL, RESIDENCY No. 10-B.

C. J. McDonough, Assistant Engineer in charge, reports as follows:

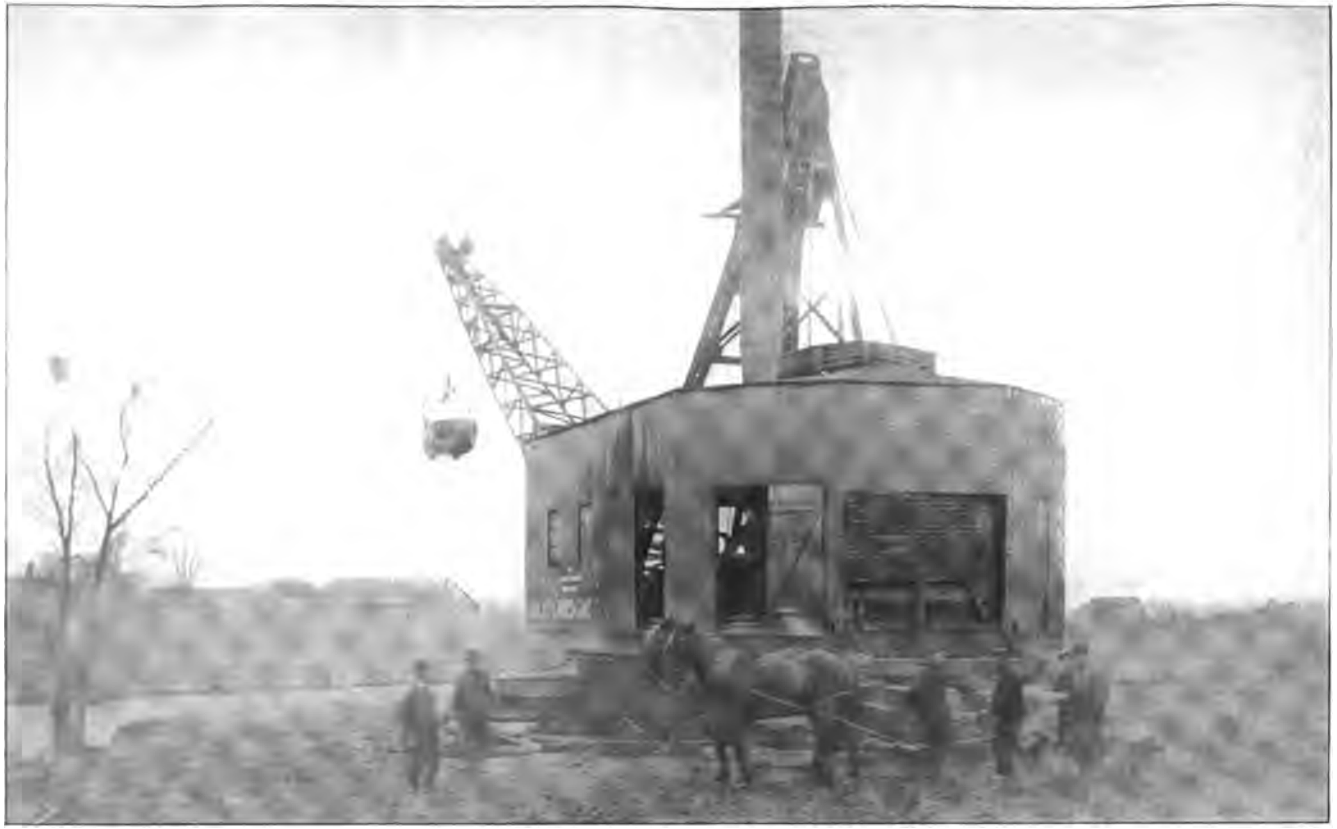
"This residency extends for a point about 100 feet east of Gasport bridge to the guard-lock at Pendleton, Niagara county, a distance of 11.7 miles.

"This residency embraces three contracts, namely, Nos. 66, 67 and 40, and separate contracts, for two life-bridges at Lockport and a new guard-gate at Gasport. Of these but two have been let — Nos. 66 and 40.

"*Contract No. 66.* This is the most westerly contract on the sixty-mile level. It extends from 100 feet east of Gasport bridge to a point about 600 feet east of the Lockport locks, a distance of 6.35 miles.

"This contract was awarded on September 22, 1908, to the Empire Engineering Corporation, of New York, and is to be completed on October 15, 1911. E. H. Anderson, Assistant Engineer, is in charge.

"The work of excavation for culverts and bridge abutments was started November 2, 1908. During the period of closed navigation the contractors worked 'dry.' Excavation at the west end



Barge Canal. Contract No. 19.
Revolving excavator building dike for hydraulic spoil. Turntable operated by team during repairs to engine.

of the contract was made with a steam-shovel and at other points by hand labor and teams.

" Concrete walls at the west end of the contract are about 60 per cent completed. An elevator dredge, with separate conveyor, was constructed at Gasport by the Bucyrus Company and began excavation on September 8 at Gasport, working westerly and excavating for the remainder of the month 10,754 cubic yards. Dredging will be completed the following season.

"About 75 per cent of the culvert work has been finished. The remainder will be completed during the coming winter.

" New bridges have been constructed at Lake avenue, Young's bridge, Wakeman's bridge and at Orangeport. Millard's bridge will be completed during the coming winter.

" During the period of closed navigation, when the elevator dredge is inoperative, two light steam-shovels can be used to advantage in the bed of the canal.

" The greater part of the work remaining on this contract is excavation, embankment and the placing of wash-wall for protecting the sides of the canal.

" The following table shows the relative amounts of work done on this contract:

ITEMS OF WORK.	Perliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Coffer-dams, pumping, bailing & draining, miles	6.35	1.461	1.461	2.3	2.3
Clearing............lump sum	$1,900	$570	$570	30	30
Grubbing............cu. yds.	30,925	2,939	2,939	9.5	9.5
Excavation............cu. yds.	596,865	94,748	94,748	16	16
Sheeting and bracing............ft. B. M.	50,000	19,081	19,081	38.2	38.2
First-class embankment............cu. yds.	276,395	21,150	21,150	7.6	7.6
Second-class embankment............cu. yds.	61,600	27,863	27,863	45.2	45.2
Lining............cu. yds.	17,012	69	69	4	4
Puddle............cu. yds.	8,044	1,066	1,066	13.2	13.2
Sawed lumber............ft. B. M.	18,000	15,826	15,826	87.9	87.9
Foundation piles............lin. ft.	3,830	2,900	2,900	75.8	75.8
Second-class concrete............cu. yds.	9,936	6,284	6,284	63.2	63.2
Third-class concrete............cu. yds.	1,420	480	480	33.8	33.8
Reinforced concrete............cu. yds.	550	432	432	78.6	78.6
First-class masonry coping............cu. yds.	10	1.64	1.64	16.4	16.4
Wash-wall............cu. yds.	52,870	1,854	1,854	3.5	3.5
Second-class paving............sq. yds.	525	409	409	78	78
Cast iron culvert pipe and specials............lbs.	104,600	51,527	51,527	49	49
Structural steel............lbs.	683,300	558,154	558,154	81.7	81.7
Metal reinforcement............lbs.	55,600	55,600	40,227	72.5	72.5
4-in. wood pavement............sq. yds.	340	333	333	100	100
3-inch wood pavement............sq. yds.	1,200	892	892	74.3	74.3
Wood fence............lin. ft.	8,940	1,417	1,417	15.9	15.9
Wrought iron pipe railing............lin. ft.	30	26	26	100	100
Lattice railing............lin. ft.	640	632	632	100	100
Drilling bolt holes in masonry............lin. ft.	650	200	200	30.1	30.1
Maintaining navigation............lump sum	$8,250	$1,897.50	$1,897.50	23	23
Maintaining highway traffic............lump sum	$3,000	$690	$690	23	23
Gross estimate............	$726,090 10	$173,848 85	$173,848 85	23.9	23.9

"*Contract No.* 67. For the construction of two locks and three bridges and prism work in the city of Lockport. This contract has not yet been advertised.

"*Contract No.* 40. This contract extends from a point about 1,800 feet west of the Lockport locks to the Sulphur spring guard-lock at Pendleton, a distance of 4.84 miles and was awarded to the United Engineering and Contracting Company, of New York city, on November 27, 1908. The contract is to be completed December 1, 1911. Edward Anderberg, Assistant Engineer, is in charge.

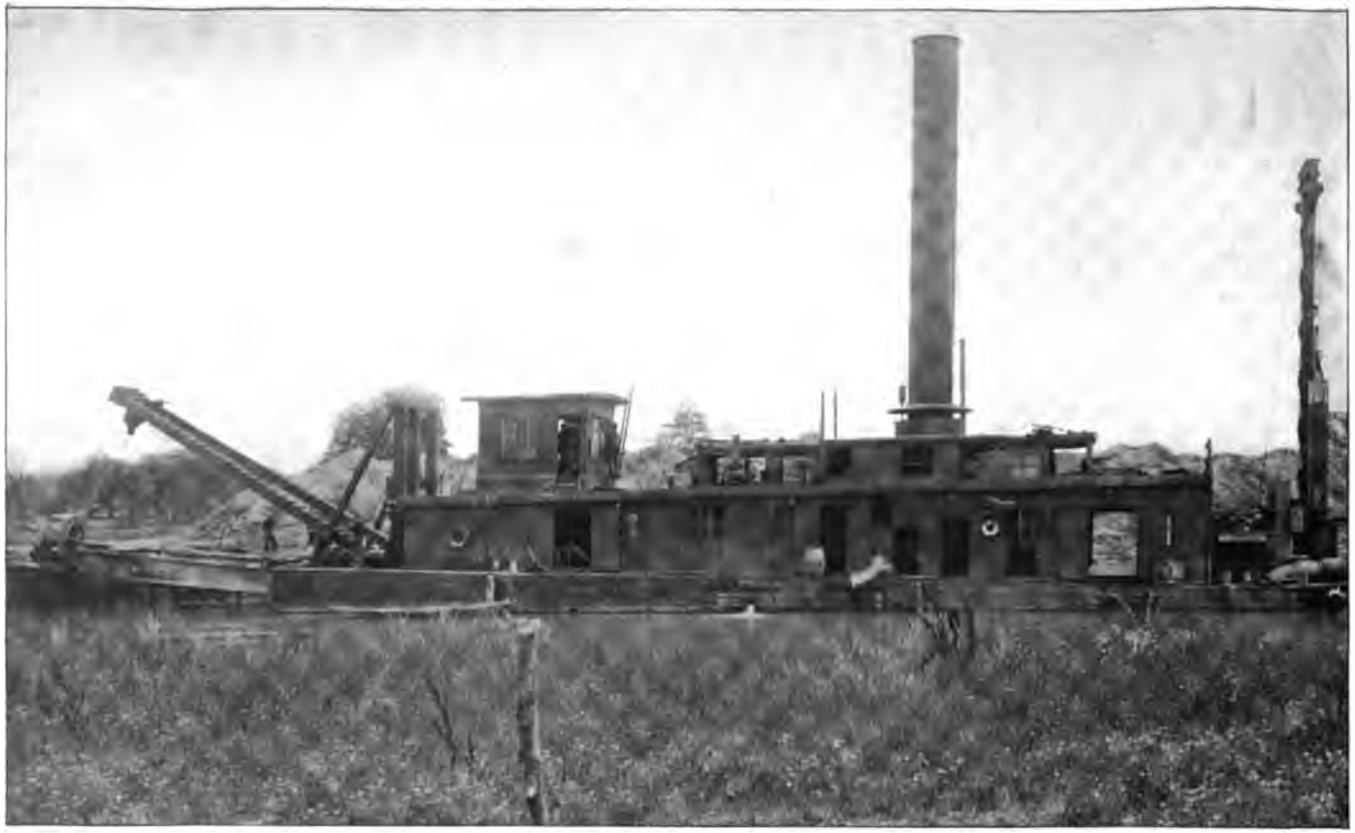
"Monumenting of center line and about 80 per cent of the appropriation surveys were completed before the contract was started. The appropriation surveys are now complete.

"A central power plant for the distribution of compressed air along the contract was erected at the Hinman road during February and March, 1909. This plant is operated by electricity, supplied by the Niagara, Lockport and Ontario Power Co.

"Actual work on the contract was started on March 15, 1909, for that portion of the canal at the east end of the contract. Drills, steam-shovels and trains delivering to spoil banks were operated on the tow-path side of what is known as the harbor section. On the southerly side excavation was made by drills and steam-shovel, with two locomotive cranes delivering material into spoil banks. This plant is all steam operated and the total excavation up to September 30, 1909, was 61,109 cubic yards, of which about 75 per cent was ledge rock.

"Just west of this point, stripping excavation was started September 1, 1909, with teams and a 40-ton Marion shovel operated by air. On September 16 a 3-cubic yard Hammond scraper bucket, operated by hoisting engine and single power, began opperation. A 70-ton Bucyrus shovel, operating with tipple conveyor, has also been installed. This plant is to be operated by compressed air.

"Excavation work was begun June 3, 1909, with a 450-foot span, cantilever, operated by electricity. This machine was erected by the Browning Company, and equipped with a 4-cubic yard drag bucket. This machine was guaranteed to excavate an average of 90 cubic yards per hour, operated through a test of 120 hours, equivalent to 15 8-hour days. The official test began



Barge Canal, Contract No. 19.
View of the hydraulic dredge *Niagara* at work in a cut-off channel.

on September 1 and ended on September 9, working 14 hours per day. During the test 14 hours were lost. The machine excavated 9,600 cubic yards, as against 10,800 cubic yards, guaranteed. During the remainder of the month, the machine was operated for 52 shifts and totalled 36,079 cubic yards for the whole month, or an average of 64 cubic yards per hour outside of test. The total excavation made by the cantilever since June 3 is 82,810 cubic yards, all of which is in earth. During the winter months, when the water is drained from the canal, this machine is to be operated as a conveyor in connection with a steam-shovel placed in the bed of the canal.

" Excavation by hand labor and derricks has been carried on near Hitchen's bridge since June. A total of 17,458 cubic yards has been excavated by this method, about 50 per cent of which was rock. A cableway is complete and ready for operation at the west end of the contract.

" During the winter season the contract will be worked dry. The plan of operation is to place 9 steam-shovels in the canal, delivering to cableways and conveyors of various types for depositing material in the spoil banks.

" The following table gives the status of the work at the present time and shows the progress during the past year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Clearing............lump sum	$2,000	$600	$600	30	30
Excavation............cu. yds.	1,822,314	173,415	173,415	9.5	9.5
Gross estimate............	$2,168,998	$135,863 70	$135,863 70	6.3	6.3

ERIE CANAL, RESIDENCY No. 11.

C. J. McDonough, Assistant Engineer, in charge of this residency, reports as follows:

" This residency extends from the head of Sulphur Springs guard-lock, in the town of Pendleton, to and through the city of Buffalo.

" Two contracts are embraced on this residency, namely, No. 19 and a contract from Delaware avenue bridge to the Niagara river, which has not yet been advertised.

"*Contract No.* 19 extends from the guard-lock to the Delaware avenue bridge, Tonawanda, a distance of 12.46 miles. This contract was awarded to the Great Lakes Construction Company, of Buffalo, N. Y., November 26, 1906; contract to be completed December 31, 1910.

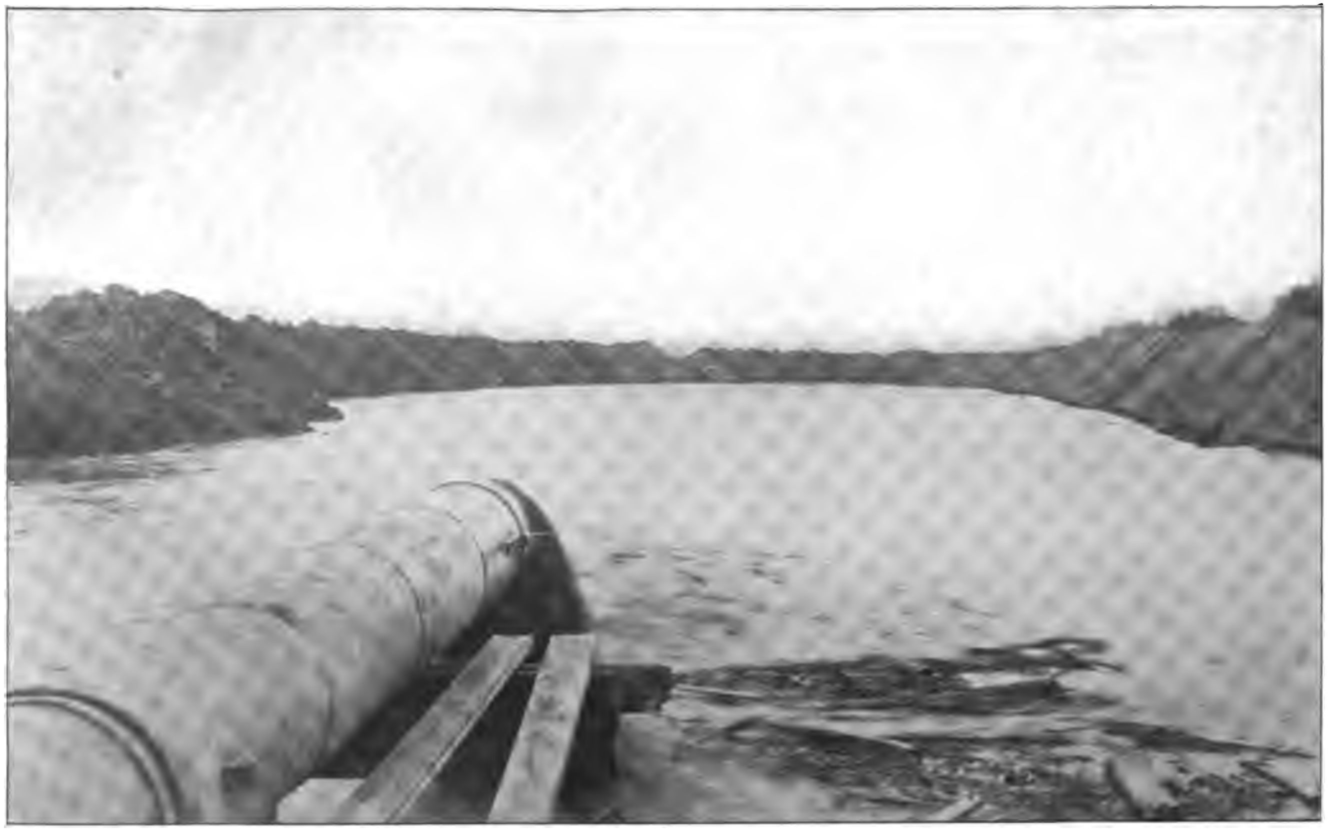
"C. J. McDonough, Wm. C. Perkins, A. W. Kemper and O. L. Burdett, Assistant Engineers, have successively been in charge of this contract.

"In the early stages of this contract, an attempt was made to excavate the prism by means of dipper dredges and clam-shell dredges, the method attempted being to rehandle the material in spoil banks. This proved to be impracticable and the hydraulic dredge, *Niagara,* built by the Bucyrus Company, was placed in operation the latter part of June, 1909. This dredge has 550 horse-power, triple-expansion engines and 20-inch pumps and suctions. During three months of operation, up to October 1, 1909, the dredge removed 277,248 cubic yards.

"During January, 1909, at Pendleton, an earth dam was begun and two steam-shovel plants brought to the work preparatory to excavation of rock in the dry. Owing to objections made by the city of Lockport against the shutting off of canal water during the winter season, permission to complete the dam was not obtained until the middle of February. Work of constructing a flume for the delivery of water to the city of Lockport was started February 22. On the 24th a flood occurred in the Tonawanda creek which demolished the dam and the plan of dry excavation was abandoned for the season.

"A Lidgerwood cableway, operating at Pendleton, reached the east end of the contract on December 3, when it was laid up for the winter. During the present working season the cableway was idle up to June. Since that time it has been engaged in placing in spoil bank material excavated by the dipper dredge.

"Clam-shell dredges *Long Tom* and *Lawton* were used for placing spoil from the dipper dredge *Buffalo*. The three machines, acting as one unit, excavated about 36,000 cubic yards up to the close of 1908. One of these machines was then sold and the other placed at the new concrete dock at Tonawanda, where it has since been employed.



BARGE CANAL, CONTRACT NO. 19.
Discharge from the hydraulic dredge *Niagara* into spoil area.

"The dipper dredge, *Buffalo,* was rebuilt last spring and began work in June. It is at present used in dredging hard material on the land cut known as the Six Mile Bend and dumping into a sump previously excavated by the hydraulic dredge.

"The McMyler excavator, *Dreadnaught,* with 90-foot boom and Page bucket, was placed last November building dykes for the hydraulic dredge. This machine has been engaged at this work during the past year. Another machine of the same type, with 40-foot boom, was erected and installed on the work last spring. This machine has also been engaged in building dikes.

"The following structures were constructed during the year: Pendleton highway bridge and about 1,400 linear feet of concrete docking wall at Tonawanda. Bush's highway bridge will be completed during the month of November.

"Work on the Delaware avenue highway bridge at Tonawanda has been abandoned, pending a report of the Terminal Commission on the question of lift bridges.

"An extension of time on this contract will undoubtedly be necessary. At the present rate of excavation, namely 100,000 cubic yards per month, about 18 working months will be necessary to complete the contract, which is almost wholly excavation.

"The following table shows the status of the work at the present time and also the progress during the past year:

ITEMS OF WORK.	Preliminary estimate.	Work done during year.	Total work done to date.	Per cent of work done during year.	Per cent of work done to date.
Excavation, guard-lock to Sta. 6180 . cu. yds.	240,000	26,826	129,992	11.2	54.2
Excavation, Sta. 6180 to Tonawanda . . cu. yds.	3,217,000	440,551	828,988	13.7	25.8
Sheeting and bracing . . . . ft. B. M.	974,000	721,976	730,346	74.1	75
Embankment . . . . cu. yds.	36,000	4,892	4,892	13.6	13.6
Lining . . . . cu. yds.	2,200	10	10	0.5	0.5
Round timber . . . . lin. ft.	16,000	14,184	14,184	88.7	88.7
Foundation piles, 20 feet long . . . . No.	340	2	46	0.6	13.5
Sheet-piling . . . . ft. B. M.	44,000	8,370	8,370	19	19
Second-class gravel concrete . . . . cu. yds.	15,900	7,520	7,520	47	47
Reinforced concrete . . . . cu. yds.	400	144	144	36	36
Cobblestone paving . . . . sq. yds.	95	62	62	65.3	65.3
Metal reinforcement . . . . lbs.	45,770	15,843	15,843	34.7	34.7
Structural steel . . . . lbs.	257,640	215,490	215,490	83.6	83.6
Removing bridge superstructures . . . lump sum	$359	$179 50	$179 50	50	50
Maintaining traffic . . . . lump sum	$599	$179 70	$179 70	30	30
Total estimate	$892,921 91	$180,951 60	$311,306 72	20.3	34.8

IMPROVEMENT OF PUBLIC HIGHWAYS.

(CHAPTER 115, LAWS OF 1898, AND AMENDATORY LAWS.)

A detailed account of the roads completed between the beginning of the fiscal year and the time when the work of highway improvement was turned over to the Highway Commission is given in the following pages:

CHILI (SECTION 1) ROAD, NO. 254, MONROE COUNTY.

Length, 3.11 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $27,700.

Contract dated, July 11, 1906.

Work commenced, May 9, 1908.

Work completed, October 14, 1908.

Final account, $26,667.63.

Contractor, F. A. Brotsch.

Engineer in charge, J. R. Rogers.

From the westerly boundary of the city of Rochester, this road extends southwesterly to the line between the towns of Gates and Chili in the town of Gates, Monroe county. Three inches of broken limestone were used for constructing both top and bottom courses.

CHILI (SECTION 2) ROAD, NO. 255, MONROE COUNTY.

Length, 2.56 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $26,000.

Contract dated, July 11, 1906.

Work commenced, July 25, 1908.

Work completed, November 19, 1908.

Final account, $20,808.54.

Contractor, F. A. Brotsch.

Engineer in charge, J. R. Rogers.

From the southerly line of the town of Gates this road extends southwesterly to the village of Chili in the town of Chili, Monroe county. Three inches of broken limestone were used for constructing both top and bottom courses.

CLOVER STREET (SECTION 1) ROAD, NO. 294, MONROE COUNTY.

Length, 5.89 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $44,900.

Contract dated, September 17, 1907.

Work commenced, September 25, 1907.

Work completed, October 14, 1908.

Final account, $40,895.61.

Contractor, Monroe Roads Co.

Engineer in charge, W. G. Harger.

This road extends from Monroe avenue southerly to the southerly line of the town of Pittsford in the towns of Brighton and Pittsford, Monroe county. Four inches of local stone were used for the bottom course and three inches of granite for the top course.

On June 2, 1908, the Board of Supervisors of Monroe county authorized by resolution an additional appropriation of $700 for sub-base and tile, being one-half of the total amount of $1,400 required for this purpose.

WELLSBURG ROAD, NO. 355, CHEMUNG COUNTY.

Length, 4.512 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $55,000.

Contract dated, March 9, 1908.

Work commenced, May 26, 1908.

Work completed, November 27, 1908.

Final account, $54,396.73.

Contractors, Bennett & Ryan, assigned to Albertson & Adams.

Engineer in charge, John Philo Kelley.

From the southerly limits of the city of Elmira, on Maple avenue, this road extends southerly to the village of Wellsburg in the towns of Southport and Ashland. Three inches of broken limestone were used in both top and bottom courses.

On December 3, 1907, the Board of Supervisors of Chemung county appropriated $2,960.88, as the county and town's share of the total increased cost of $6,000.

HORSEHEADS–CORNING ROAD, No. 358, CHEMUNG COUNTY.

Length, 7.143 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $80,600.

Contract dated, December 2, 1907.

Work commenced, May 23, 1908.

Work completed, October 26, 1908.

Final account, $77,159.39.

Contractors, Casey & Murray.

Engineer in charge, John P. Kelley.

From near the southwest corner of the village of Horseheads, in what is known as Chemung street, this road extends westerly through the towns of Horsheads and Big Flats to the western boundary of the county of Chemung by the direct roads leading from Horseheads to the corners. Three inches of local limestone were used both for bottom and top courses.

CLINTON STREET (SECTION 1) ROAD, No. 371, ERIE COUNTY.

Length, 5.65 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $55,900.

Contract dated, July 18, 1906.

Work commenced, August 6, 1906.

Work completed, November 2, 1908.

Final account, $153,996.03.

Contractor, Gantz-Wilson Construction Company.

Engineers in charge, John S. Clancy, W. T. Huber and J. F. Hussey.

This improvement extends from the east line of the city of Buffalo easterly to the west line of the town of Elma in the towns of Cheektowaga and West Seneca, Erie county.

The Board of Supervisors of Erie county passed a resolution April 9, 1907, appropriating $35,700 (in addition to the $27,950 originally appropriated, December 29, 1903,) that a brick pavement 16 feet wide on a five-inch concrete base might be substituted for the 16 feet of macadam as originally planned.

The Board of Supervisors also passed a resolution on May 19, 1908, appropriating $15,372, being the county's and town's share of a total appropriation of $30,744 for a brick pavement, with concrete curbs between sections 150 + 50 and 298 + 25.

CLINTON STREET (SECTION 2) ROAD, NO. 372, ERIE COUNTY.

Length, 6.14 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $61,500.

Contract dated, July 18, 1906.

Work commenced, July 2, 1907.

Work completed, March 2, 1908.

Final account, $119,578.04.

Contractor, Gantz-Wilson Construction Co.

Engineers in charge, John S. Clancy, John F. Hussey, A. F. Bechtold and E. M. Faller.

This improvement extends from the east line of the town of West Seneca easterly to the west line of the town of Manilla, in the town of Elma, Erie county.

Originally a macadam highway was planned, but by a supplementary agreement a brick pavement on a five-inch concrete base was substituted between Stations 295 + 25 and 622 + 53.

The Board of Supervisors of Erie county passed resolutions on May 19, 1908, appropriating $33,428, being the county's and town's share of a total appropriation of $66,856 for a brick pavement with concrete curbs, etc., between the stations named.

GOODRICH ROAD, NO. 373, ERIE COUNTY.

Length, 8.77 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $84,400.

Contract dated, July 9, 1906.

Work commenced, April 8, 1907.

Work completed, November 2, 1908.

Final account, $73,001.56.

Contractor, Baldwin Contracting Co.

Engineers in charge, Charles A. Carruth and R. W. Heerlein.

This improvement extends from Main street road to Tonawanda creek in the town of Clarence, Erie county. Limestone was used throughout in its construction, three and five inches in the bottom course, and three inches for the top course.

FIVE CORNERS–KUCKVILLE (SECTION 2) ROAD, NO. 387, ORLEANS COUNTY.

Length, 5.80 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $41,500.

Contract dated, August 31, 1906.

Work commenced, April 9, 1907.

Work completed, November 2, 1908.

Final account, $37,162.38.

Contractor, Thomas Hucknell.

Engineer in charge, G. A. Wright.

This improvement extends from the south line of the town of Carlton northerly to Johnson's creek in the town of Carlton, Orleans county. Three and five inches of local stone were used in the bottom course and three inches in the top course on this road.

LATTA ROAD, NO. 399, MONROE COUNTY.

Length, 6.84 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $82,000.

Contract dated, September 19, 1907.

Work commenced, March 15, 1908.

Work completed, October 14, 1908.

Final account, $78,077.22.

Contractor, Jeremiah T. Finch.

Engineer in charge, Joseph W. Howe.

This improvement extends from the west line of the village of Charlotte westerly to the town line of Parma in the town of

Greece, Monroe county. Five inches of local limestone were used for the bottom course and three inches for the top course.

On October 2, 1907, the Board of Supervisors of Monroe county appropriated $9,300 additional, as its one-half to provide for an 8-inch thickness of macadam in place of 6 inches as originally planned.

BUFFALO (SECTION 3) ROAD, NO. 402, MONROE COUNTY.

Length, 3.62 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $32,300.

Contract dated, December 4, 1907.

Work commenced, May 1, 1908.

Work completed, September 21, 1908.

Final account, $26,145.92.

Contractor, Greece Construction Co.

Engineer in charge, G. G. Miller.

This road extends from the line between the towns of Gates and Ogden southwesterly to the line between the towns of Riga and Chili, in the towns of Chili and Ogden, Monroe county. Local limestone was used in construction,— four inches for the bottom and three inches for the top course.

CHURCHVILLE–RIGA ROAD, NO. 403, MONROE COUNTY.

Length, 2.08 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $20,100.

Contract dated, November 26, 1907.

Work commenced, July 18, 1908.

Work completed, November 30, 1908.

Final account, $19,602.53.

Contractors, Patrick A. Lillis; assigned to Rockefeller Bros.

Engineer in charge, M. A. Finch.

This road extends from the south line of the village of Churchville southerly to the cross roads at Riga Center in the town of Riga. Three inches of local stone were used for the bottom course and three and four inches for the top.

On October 2, 1907, the Board of Supervisors of Monroe county passed a resolution appropriating $2,300, as its one-half of the increased cost for providing a cobblestone sub-base on a portion of the road.

On July 1, 1908, the Board of Supervisors of Monroe county passed a resolution asking that the width of macadam be changed from 12 to 14 feet and appropriating $1,100, being their one-half of the total cost of such change. Special agreement concerning this change was entered into on July 25.

CLOVER STREET (SECTION 2) ROAD, NO. 474, MONROE COUNTY.

Length, 1.95 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $17,200.

Contract dated, November 26, 1907.

Work commenced, June 20, 1908.

Work completed, October 14, 1908.

Final account, $16,899.26.

Contractors, Patrick H. Lillis; assigned to A. J. Rockwood.

Engineer in charge, E. P. Strowger.

This road extends from the Monroe avenue road northerly to the East avenue road in the town of Brighton, Monroe county. Three inches of local limestone were used in both bottom and top courses.

On August 3, 1908, the Board of Supervisors of Monroe county appropriated $1,000, being the county's share of the total cost of $2,000 for lowering the grade.

WEST BLOOMFIELD–HONEOYE FALLS ROAD, NO. 485, ONTARIO COUNTY.

Length, 3.76 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimates of total cost, including engineering, $32,900.

Contract dated, January 20, 1908.

Work commenced, May 30, 1908.

Work completed, October 26, 1908.

Final account, $30,149.46.

Contractor, H. P. Burgard Co.

Engineer in charge, John Philo Kelley.

From the north county line this road extends in a southeasterly direction to Hains Corners, thence southerly to the main road running east and west through the village of West Bloomfield in the town of West Bloomfield, Ontario county. On this road three inches of broken limestone were used for both courses.

NORTH COLLINS–LAWTON ROAD, NO. 524, ERIE COUNTY.

Length, 5.43 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $73,900.

Contract dated, September 17, 1907.

Work commenced, April 11, 1908.

Work completed, October 20, 1908.

Final account, $65,857.26.

Contractors, Mosier and Summers.

Engineer in charge, J. H. Huber.

This road extends from the south line of the town of Eden southerly to the north line of the town of Collins in the town of North Collins, Erie county. Five inches of broken limestone were used in constructing the bottom course and three inches in the top course of this road.

LAWTON–GOWANDA ROAD, NO. 525, ERIE COUNTY.

Length, 4 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $46,900.

Contract dated, September 20, 1907.

Work commenced, April 11, 1908.

Work completed, October 20, 1908.

Final account, $35,726.95.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineer in charge, A. R. Erskine.

This road extends from the south line of the town of North Collins southerly to the north line of the village of Gowanda in the town of Collins, Erie county. Three-inch top and bottom courses of broken limestone were used in constructing this road.

ALDEN–TOWN LINE, CLINTON ST.–MARILLA ROAD, NO. 529, ERIE COUNTY.

Length, 6.02 miles.

Width of macadam, 12 and 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $49,000.

Contract dated, September 20, 1907.

Work commenced, June 20, 1908.

Work completed, December 10, 1908.

Final account, $45,327.77.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineers in charge, E. M. Secrist and T. J. Smith.

This road extends from the west line of the village of Alden westerly to the Town Line road, in the town of Alden, and from the east line of the town of Elma easterly and southerly to Marilla, in the town of Marilla, Erie county. On this road three inches of broken limestone were used for both courses.

BASE LINE–GRAND ISLAND (SECTION 1) ROAD, NO. 530, ERIE COUNTY.

Length, 1.81 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $14,000.

Contract dated, September 20, 1907.

Work commenced, June 6, 1908.

Work completed, October 20, 1908.

Final account, $12,911.93.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineers in charge, H. R. Breese and T. J. Smith.

This road extends from the Niagara river westerly and northerly to Warrendale, in the town of Grand Island, Erie county. Three inches of broken limestone were used for both top and bottom courses in its construction.

BASE LINE–GRAND ISLAND (SECTION 2) ROAD, NO. 531, ERIE COUNTY.

Length, 2.59 miles.

Width of macadam, 14 feet.

Engineer's preliminary estimate of total cost, including engineering, $19,800.

Contract dated, December 18, 1907.

Work commenced, July 2, 1908.

Work completed, December 14, 1908.

Final account, $17,766.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineer in charge, H. R. Breese.

This road extends from Warrendale northerly to Inland, in the town of Grand Island, Erie county. Three inches of broken limestone were used for both top and bottom courses.

BASE LINE–GRAND ISLAND (SECTION 3) ROAD, NO. 532, ERIE COUNTY.

Length, 1.87 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of toal cost including engineering, $11,400.

Contract dated, December 18, 1907.

Work commenced, July 11, 1908.

Work completed, October 20, 1908.

Final account, $10,199.03.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineers in charge, H. R. Breese and T. J. Smith.

This road extends from Inland northerly to Wood creek, in the town of Grand Island, Erie county. Broken limestone was used throughout in its construction in two three-inch courses.

SKINNERSVILLE — NEW HOME BRIDGE ROAD, NO. 584, ERIE COUNTY.

Length, 7.96 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost including engineering, $87,700.

Contract dated, May 7, 1908.

Work commenced, June 6, 1908.

Work completed, December 4, 1908.

Final account, $85,533.71.

Contractor, Henry P. Bayard.

Engineer in charge, John C. Clancy.

This road extends from its intersection with the Main street road northerly to Tonawanda creek in the town of Amherst, Erie county. Five inches of broken limestone was used for the bottom course and four inches for the top course.

OLEAN–ALLEGANY (SECTIONS 1 AND 2) ROAD, NO. 601, CATTARAUGUS COUNTY.

Length, 3.09 miles.

Width of macadam, 16 and 20 feet.

Engineer's preliminary estimate of total cost including engineering, $39,000.

Contract dated, September 24, 1907.

Work commenced, August 8, 1908.

Work completed, November 2, 1908.

Final account, $31,349.95.

Contractor, Gantz-Wilson Construction Co.

Engineer in charge, Clarence Colony.

This road extends from the junction of the Five-Mile and Nine-Mile roads, southeasterly to the west line of the town of Olean in the town of Allegany, and from the east line of the town of Allegany, easterly to the west line of the city of Olean in the town of Olean, Cattaraugus county. Four inches of gravel were used for the bottom course and four inches of broken limestone for the top course.

MANCHESTER–CLIFTON SPRINGS ROAD, NO. 607, ONTARIO COUNTY.

Length, 4.35 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $26,600.

Contract dated, December 18, 1907.

Work commenced, May 30, 1908.

Work completed, November 25, 1908.

Final account, $26,438.87.

Contractor, Gantz-Wilson Construction Co.

Engineer in charge, John Philo Kelley.

Extending from the east corporation line of the village of Manchester this road runs easterly to the intersection of the highway between Clifton Springs and Gypsum, thence south to the north line of the village of Clifton Springs, in the town of Manchester, Ontario county. Three-inches of local stone were used for both courses in construction.

On December 2, 1907, the Board of Supervisors of Ontario county passed a resolution appropriating $1,300 as its share of the additional cost of the road, which additional cost amounts to $2,600.

PHELPS–CLIFTON SPRINGS ROAD, NO. 608, ONTARIO COUNTY.

Length, 2.21 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $12,700.

Contract dated, December 18, 1907.

Work commenced, May 30, 1908.

Work completed, November 6, 1908.

Final account, $14,670.16.

Contractor, Gantz-Wilson Construction Company.

Engineer in charge, John Philo Kelley.

From the west line of the village of Phelps this road extends to the east line of the village of Clifton Springs, in the township of Phelps, Ontario county. Three inches of broken limestone were used in both courses in its construction.

On December 2, 1907, the Board of Supervisors of Ontario county passed resolutions further appropriating $2,000 as its share of the additional increased cost of $4,000.

LEWISTON–DICKERSONVILLE ROAD, NO. 617, NIAGARA COUNTY.

Length, 4.8 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $35,000.

Contract dated, September 20, 1907.

Work commenced, June 6, 1908.

Work completed, November 2, 1908.

Final account, $32,048.23.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineer in charge, W. C. Perkins.

This road extends from the east line of the village of Lewiston easterly to Dickersonville (except through the Tuscarora Indian Reservation) in the town of Lewiston, Niagara county. Local limestone was used throughout construction in two courses of three inches each.

NORTH TONAWANDA–SANBORN ROAD, NO. 643, NIAGARA COUNTY.

Length, 4.44 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $43,200.

Contract dated, December 18, 1907.

Work commenced, May 23, 1908.

Work completed, November 2, 1908.

Final account, $38,899.63.

Contractor, Stewart-Kerbaugh-Shanley Co.

Engineer in charge, W. C. Perkins.

This road extends from the north line of the city of North Tonawanda northerly to the south line of the town of Lewiston in the town of Wheatfield, Niagara county. Five inches of broken limestone were used for the bottom course and three inches of same for the upper course.

FALCONER–KENNEDY ROAD, NO. 698, CHAUTAUQUA COUNTY.

Length, 1.044 miles.

Width of macadam, 12 feet.

Engineer's preliminary estimate of total cost, including engineering, $11,500.

Contract dated, February 5, 1908.

Work commenced, July 18, 1908.

Work completed, November 30, 1908.

Final account, $9,115.95.

Contractors, G. M. Love and Son.

Engineer in charge, S. O. Steere.

This road extends from the village of Falconer easterly to the line between the towns of Ellicott and Poland, in the town of Ellicott, Chautauqua county. Limestone was used throughout for macadam, five inches for the bottom course and three inches for the upper course.

PORTVILLE–OLEAN (SECTION 2) ROAD, NO. 731, CATTARAUGUS COUNTY.

Length, 2.06 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $69,600.

Contract dated, January 30, 1908.

Work commenced, September 18, 1908.

Work completed, November 25, 1908.

Final account, $20,994.02.

Contractor, The Star Constructing Company.

Engineer in charge, Jos. W. Howe.

This road extends from the east line of the city of Olean southeasterly to the west line of the town of Portville in the town of Olean, Cataraugus county. Limestone for macadam, in two courses of four inches each, was used in its construction.

BIG FLATS–GIBSON ROAD, NO. 742, STEUBEN COUNTY.

Length, 4.33 miles.

Width of macadam, 16 feet.

Engineer's preliminary estimate of total cost, including engineering, $56,200.

Contract dated, January 30, 1908.

Work commenced, May 15, 1908.

Work completed, October 26, 1908.

Final account, $49,706.33.

Contractors, Bradley and Nolan.

Engineer in charge, J. T. Schuyler.

Beginning at the Chemung county line on the north side of the Chemung river on the main highway from the village of Big Flats and running westerly this road extends to the river bridge at Gibson in the town of Corning, Steuben county. Three inches of local limestone were used for both top and bottom courses.

CONCLUSION.

A statement of the engineering expenses of the Division and tables of contracts completed during the fiscal year and those in force at its close, are hereto appended.

The business of this office has been very large, by reason of the constantly increasing amount of work under contract. The engineering force has varied from 140 to 175 men since the separation of the road department.

The efficiency of the organization has been constantly increasing and is now most marked.

The entire organization has rendered valuable assistance and the writer desires to express his appreciation of their efficient and conscientious service.

I desire also to thank you and your Deputies for the valuable suggestions and hearty coöperation, which has greatly assisted me in the performance of my duties.

Respectfully submitted,
T. W. BARRALLY,
Division Engineer.

THE FOLLOWING STATEMENTS SHOW THE NAMES, RANK AND COMPENSATION OF ENGINEERS IN THE WESTERN DIVISION OF THE DEPARTMENT OF THE STATE ENGINEER AND SURVEYOR, TOGETHER WITH INCIDENTAL EXPENSES FOR THE FISCAL YEAR, ENDED SEPTEMBER 30, 1909.

Ordinary Repairs to Canals — Erie Canal.

Chapter 465, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
John P. Kelly	Division engineer	$300 00 per month	$966 27		$966 27
T. W. Barrally	Division engineer	300 00 per month	2,612 90	$0 30	2,613 20
Jacob G. Soergel	Financial clerk	5 00 per day	655 00		655 00
A. B. Williams	Estimate clerk	150 00 per month	750 00		750 00
Anna M. Lorscheider	Stenographer	83 33 per month	166 70		166 70
Anna M. Lorscheider	Stenographer	100 00 per month	1,000 00		1,000 00
Margaret McElligott	Stenographer	75 00 per month	37 50		37 50
M. Madden	Stenographer	2 00 per day	104 00		104 00
Wm. M. Thomas	Stenographer		108 00		108 00
E. A. Bonney	Draftsman	5 00 per day		6 15	6 15
					$6,406 82
Incidental Expenses.					
Stationery and printing				$234 67	
Livery				16 00	
Postage				30 02	
Office rent				885 00	
Telephone and telegraph				110 02	
Miscellaneous				725 83	
					2,001 54
Total					$8,408 36

Construction of Barge Canal — Erie Canal.

Chapter 147, Laws of 1903.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
John P. Kelly	Division engineer	$300 00 per month		$256 38	$256 38
T. W. Barrally	Division engineer	300 00 per month		372 66	372 66
B. E. Failing	Resident engineer	200 00 per month	$2,400 00	194 19	2,594 19
O. F. Bellows	Resident engineer	200 00 per month	1,200 00	63 49	1,263 49
Thos. J. Morrison	Resident engineer	200 00 per month	2,400 00	165 42	2,565 42
Chas. A. Ingersoll	Resident engineer	200 00 per month	2,400 00	441 01	2,841 01
T. W. Barrally	Resident engineer	200 00 per month	658 06	92 09	750 15
H. E. Brainard	Bridge designer	150 00 per month	375 00	16 68	391 68
C. J. McDonough	First assistant engineer	7 00 per day	2,198 00	217 87	2,415 87
John S. Clancy	Assistant engineer	6 00 per day	24 00		24 00
Wm. C. Perkins	Assistant engineer	6 00 per day	576 00	53 02	629 02
John Philo Kelley	Assistant engineer	6 00 per day	90 00	15 66	105 66
Edw. Anderberg	Assistant engineer	6 00 per day	1,566 00	232 15	1,798 15
Fred. J. Wilbur	Assistant engineer	6 00 per day	1,944 00	6 00	1,950 00
J. Seward Summers	Assistant engineer	6 00 per day	1,866 00	452 67	2,318 67
Elmer C. Lawton	Assistant engineer	6 00 per day	786 00	38 23	824 23
Frank T. Marsh	Assistant engineer	6 00 per day	1,854 00	502 16	2,356 16
Jos. H. Young	Assistant engineer	6 00 per day	1,596 00	710 40	2,306 40
H. R. Wickham	Assistant engineer	6 00 per day	312 00	118 82	430 82
H. J. Hemstreet	Assistant engineer	6 00 per day	1,890 00	385 60	2,275 60

Construction of Barge Canal — Erie Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
A. S. Milinowski	Assistant engineer	$6 00 per day	$798 00	$421 48	$1,219 48
Geo. C. Mills	Assistant engineer	6 00 per day	570 00	695 75	1,265 75
Lewis G. Fisher	Assistant engineer	6 00 per day	1,980 00	472 89	2,452 89
A. L. Simmons	Assistant engineer	6 00 per day	564 00	109 81	673 81
R. H. Merrill	Assistant engineer	6 00 per day	816 00	70 79	886 79
Arthur S. Whitbeck	Assistant engineer	6 00 per day	1,878 00	446 76	2,324 76
Elias H. Anderson	Assistant engineer	6 00 per day	1,596 00	321 23	1,917 23
John H. Huber	Assistant engineer	6 00 per day	336 00	15 35	351 35
G. M. Briggs	Assistant engineer	5 00 per day	165 00	142 90	307 90
M. A. Finch	Assistant engineer	5 00 per day	625 00	13 50	638 50
Hall Gleason	Assistant engineer	5 00 per day	10 00	....	10 00
S. O. Steere	Assistant engineer	5 00 per day	110 00	42 79	152 79
M. W. Williams	Assistant engineer	5 00 per day	45 00	13 67	58 67
W. A. Kemper	Assistant engineer	5 00 per day	1,200 00	176 19	1,376 19
Elmer C. Lawton	Assistant engineer	5 00 per day	910 00	59 27	969 27
H. R. Wickham	Assistant engineer	5 00 per day	1,315 00	340 44	1,655 44
B. L. G. Rees	Assistant engineer	5 00 per day	1,455 00	40 90	1,495 90
A. S. Milinowski	Assistant engineer	5 00 per day	920 00	304 68	1,224 68
Chas. L. Henderson	Assistant engineer	5 00 per day	1,620 00	252 49	1,872 49
O. L. Burdett	Assistant engineer	5 00 per day	1,585 00	88 77	1,673 77
Geo. D. Kellogg	Assistant engineer	5 00 per day	1,610 00	439 37	2,049 37
R. H. Merrill	Assistant engineer	5 00 per day	940 00	101 94	1,041 94
J. G. Palmer	Assistant engineer	5 00 per day	645 00	48 37	693 37
Elias H. Anderson	Assistant engineer	5 00 per day	260 00	60 72	320 72
James T. Schuyler	Assistant engineer	5 00 per day	210 00	3 33	213 33
Job R. Rogers	Assistant engineer	5 00 per day	270 00	65 82	335 82
Peter Sheridan	Financial clerk	5 00 per day	230 00	22 66	252 66
Jacob G. Soergel	Financial clerk	5 00 per day	515 00	11 00	526 00
A. B. Williams	Estimate clerk	150 00 per month	687 00	35 92	722 92
F. V. Searls	Estimate clerk	126 00 per month	1,512 00	17 42	1,529 42
A. B. Williams	Estimate clerk	126 00 per month	126 00	....	126 00
Myer Abramson	Junior clerk	40 00 per month	80 00	....	80 00
Myer Abramson	Junior clerk	50 00 per month	500 00	....	500 00
Francis R. Overend	Stenographer	60 00 per month	30 00	3 30	33 30
J. K. Browne	Leveler	5 00 per day	295 00	10 81	305 81
Raymond Sickles	Leveler	5 00 per day	1,475 00	21 91	1,496 91
J. B. Barrett	Leveler	5 00 per day	1,170 00	....	1,170 00
L. R. Barnes	Leveler	5 00 per day	665 00	....	665 00
W. T. Huber	Leveler	5 00 per day	525 00	....	525 00
Gordon Edson	Leveler	5 00 per day	1,570 00	130 20	1,700 20
Francis W. Madigan	Leveler	5 00 per day	382 00	75 27	457 27
Walter H. Clawson	Leveler	4 50 per day	427 50	....	427 50
E. E. Kidder	Leveler	4 50 per day	733 50	51 27	784 77
L. R. Barnes	Leveler	4 50 per day	504 00	5 52	509 52
W. T. Huber	Leveler	4 50 per day	621 00	....	621 00
Edgar W. Maloney	Leveler	4 50 per day	819 00	....	819 00
Geo. S. Haight	Leveler	4 50 per day	1,408 50	35 00	1,443 50
Harold N. Metzger	Leveler	4 50 per day	1,408 50	546 33	1,95[illegible] 83
Francis W. Madigan	Leveler	4 50 per day	1,053 00	156 62	1,209 62
C. L. Baldwin	Leveler	4 50 per day	1,426 50	87 13	1,513 63
C. D. Sniggs	Draftsman	5 00 per day	1,310 00	....	1,310 00
Tracey B. Smith	Draftsman	5 00 per day	130 00	....	130 00
Chas. R. Zorsch	Draftsman	4 50 per day	1,408 50	....	1,408 50
Chas. R. Waters	Draftsman	4 50 per day	706 50	8 27	714 77
Wm. H. Dernell	Draftsman	4 50 per day	1,471 50	42 14	1,513 64
Frank W. Blair	Draftsman	4 00 per day	1,112 00	....	1,112 00
Harry M. Nelson	Draftsman	4 00 per day	1,312 00	153 80	1,465 80
J. V. Hogan	Draftsman	4 00 per day	1,008 00	1 80	1,009 80
Percy L. Arnold	Draftsman	4 00 per day	240 00	17 31	257 31
C. E. Elmendorf	Draftsman	4 00 per day	936 00	3 54	939 54
G. Gale Dixon	Draftsman	4 00 per day	184 00	....	184 00
Geo. C. Britton	Draftsman	4 00 per day	1,252 00	2 78	1,254 78
H. H. Stickney, Jr.	Draftsman	4 00 per day	1,252 00	41 62	1,293 62
H. Clyde Roe	Draftsman	4 00 per day	1,252 00	....	1,252 00
H. S. Brokaw	Draftsman	4 00 per day	376 00	....	376 00
B. C. Lechler	Draftsman	4 00 per day	1,012 00	6 58	1,018 58
E. C. Getty, Jr	Draftsman	4 00 per day	364 00	10 79	374 79
Chas. J. Alber	Draftsman	4 00 per day	1,260 00	....	1,260 00
Chas. R. Waters	Draftsman	4 00 per day	632 00	....	632 00
A. B. Chappell	Draftsman	4 00 per day	1,252 00	29 42	1,281 42
R. J. Curran	Tracer	75 00 per month	891 99	12 95	904 94
John B. Doyle	Tracer	75 00 per month	450 00	....	450 00
Percy L. Arnold	Tracer	75 00 per month	133 06	....	133 06
Wm. J. Burns	Tracer	75 00 per month	413 33	....	413 33

Construction of Barge Canal — Erie Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Wm. J. Burns	Tracer	$50 00 per month	$175 00	....	$175 00
John B. Doyle	Tracer	50 00 per month	300 00	....	300 00
Percy L. Arnold	Tracer	50 00 per month	232 14	....	232 14
Chas. Montag	Tracer	50 00 per month	600 00	....	600 00
C. M. Colony	Rodman	4 00 per day	200 00	$24 30	224 30
C. J. Bean	Rodman	4 00 per day	1,260 00	6 80	1,266 80
Joseph W. Howe	Rodman	4 00 per day	1,160 00	27 48	1,187 48
M. F. Dullea	Rodman	4 00 per day	1,048 00	....	1,048 00
E. D. Bean	Rodman	4 00 per day	212 00	....	212 00
Walter G. Dubey	Rodman	4 00 per day	1,252 00	....	1,252 00
Harold Holmes	Rodman	3 50 per day	969 50	....	969 50
Philip B. Hoge	Rodman	3 50 per day	77 00	....	77 00
Wm. H. Ginnity	Rodman	3 50 per day	878 50	....	878 50
R. W. Heerlein	Rodman	3 50 per day	826 00	....	826 00
Robert C. Georger	Rodman	3 50 per day	1,004 50	2 09	1,006 59
H. H. Tripp	Rodman	3 50 per day	297 50	....	297 50
H. J. Simmelink	Rodman	3 50 per day	987 00	....	987 00
A. O. Peabody	Rodman	3 50 per day	952 00	3 71	955 71
Gerd H. Schulte	Rodman	3 50 per day	1,113 00	....	1,113 00
Morris Glassberg	Rodman	3 50 per day	1,137 50	3 00	1,140 50
M. F. Dullea	Rodman	3 50 per day	182 00	....	182 00
George Fuller	Rodman	3 50 per day	329 00	....	329 00
E. D. Bean	Rodman	3 50 per day	955 50	50 54	1,006 04
H. F. Hughes	Inspector	5 00 per day	430 00	....	430 00
James Sim	Inspector	5 00 per day	285 00	....	285 00
W. W. Barclay	Inspector	5 00 per day	385 00	....	385 00
H. F. Hughes	Inspector	4 50 per day	1,102 50	....	1,102 50
John A. Harold	Inspector	4 50 per day	72 00	19 36	91 36
Geo. F. Poinan	Inspector	4 50 per day	180 00	....	180 00
Edw. M. Poinan	Inspector	4 50 per day	63 00	....	63 00
Geo. M. Harrar	Inspector	4 00 per day	976 00	....	976 00
W. J. Kelly	Inspector	4 00 per day	380 00	....	380 00
James Sim	Inspector	4 00 per day	196 00	....	196 00
Edwin L. Wick	Inspector	4 00 per day	1,340 00	38 71	1,378 71
Wm. C. Armstrong	Inspector	4 00 per day	420 00	....	420 00
Thos. McMorrow	Inspector	4 00 per day	1,276 00	....	1,276 00
Geo. W. Rogers	Inspector	3 50 per day	....	14 66	14 66
A. W. Gillis	Inspector	3 50 per day	276 50	....	276 50
John A. Harold	Inspector	3 50 per day	105 00	....	105 00
Edw. M. Poinan	Inspector	3 50 per day	91 00	....	91 00
D. T. Simpson	Chainman	3 00 per day	705 00	2 73	707 73
E. J. Greiner	Chainman	3 00 per day	939 00	57 80	996 80
S. Covner	Chainman	2 50 per day	815 00	....	815 00
Dana M. Miner	Chainman	2 50 per day	782 50	30 22	812 72
Chas. L. Gorman	Chainman	2 50 per day	235 00	....	235 00
Fred C. Facer	Chainman	2 50 per day	782 50	100 57	883 07
Howard C. Young	Chainman	2 50 per day	352 50	67 70	420 20
J. F. Webster	Chainman	2 50 per day	730 00	2 09	732 09
James M. Wilson	Chainman	2 50 per day	237 50	4 01	241 51
W. N. Langworthy	Chainman	2 50 per day	682 50	....	682 50
Thos. McGrath	Chainman	2 50 per day	692 50	....	692 50
D. S. Hollenbeck	Boatman	3 00 per day	978 00	38 30	1,016 30
Wm. H. Guenther	Boatman	3 00 per day	939 00	....	939 00
Floyd C. Oatman	Boatman	3 00 per day	471 00	....	471 00
H. Safir	Boatman	3 00 per day	441 00	....	441 00
O. J. Townsend	Boatman	3 00 per day	372 00	....	372 00
John J. McManus	Foreman of borings	4 50 per day	409 50	16 89	426 39
Thos. B. Bowers	Foreman of borings	3 50 per day	1,102 50	188 21	1,290 71
H. Kramer	Foreman of borings	3 50 per day	875 00	132 33	1,007 33
Fred H. Palmer	Foreman of borings	3 50 per day	1,137 50	28 79	1,166 29
John A. Kelly	Axeman	2 00 per day	506 00	6 21	512 21
T. J. Smith	Axeman	2 00 per day	48 00	....	48 00
E. M. Faller	Axeman	2 00 per day	486 00	....	486 00
E. J. Fitzmartin	Axeman	2 00 per day	30 00	....	30 00
Louis H. Brandt	Axeman	2 00 per day	468 00	....	468 00
Geo. J. Seemueller	Axeman	2 00 per day	478 00	....	478 00
H. Archie Shafer	Axeman	2 00 per day	550 00	....	550 00
Wm. J. Knauer	Axeman	2 00 per day	308 00	....	308 00
Wm. E. McCarthy	Axeman	2 00 per day	116 00	....	116 00
R. A. Gross	Axeman	2 00 per day	502 00	7 65	509 65
H. A. Ingersoll	Axeman	2 00 per day	556 00	....	556 00
J. J. Mullen	Axeman	2 00 per day	360 00	....	360 00
Frank J. O'Connor	Axeman	2 00 per day	628 00	....	628 00
Paul M. Howe	Axeman	2 00 per day	646 00	....	646 00

Construction of Barge Canal — Erie Canal — (Continued).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Harry J. O'Connor	Axeman	$2 00 per day	$632 00	$35 34	$667 34
John J. Kinney	Axeman	2 00 per day	112 00	....	112 00
F. G. Kimball	Axeman	2 00 per day	344 00	....	344 00
A. W. Balliett	Axeman	2 00 per day	654 00	....	654 00
A. F. Bechtold	Axeman	2 00 per day	182 00	2 53	184 53
Allyn T. Gilbert	Axeman	2 00 per day	416 00	....	416 00
Geo. Davis	Axeman	2 00 per day	188 00	....	188 00
Frank N. Sisson	Axeman	2 00 per day	626 00	....	626 00
Harry W. Paton	Axeman	2 00 per day	482 00	....	482 00
Geo. K. Shuler	Axeman	2 00 per day	66 00	....	66 00
A. E. Williams	Axeman	2 00 per day	612 00	16 64	628 64
Sherman A. Miller	Axeman	2 00 per day	544 00	....	544 00
Finla L. Jones	Axeman	2 00 per day	576 00	....	576 00
Raymond J. Kelly	Axeman	2 00 per day	100 00	....	100 00
Earle J. Trimble	Axeman	2 00 per day	560 00	....	560 00
Fred G. Hemple	Axeman	2 00 per day	554 00	....	554 00
Thos. E. Plunkett	Axeman	2 00 per day	552 00	....	552 00
Wm. H. Barhyte	Axeman	2 00 per day	636 00	....	636 00
Burt C. Hayes	Axeman	2 00 per day	626 00	....	626 00
Lynn H. Barrows	Axeman	2 00 per day	626 00	....	626 00
Leo. Creighton	Axeman	2 00 per day	626 00	....	626 00
Wm. J. Berdel	Axeman	2 00 per day	118 00	....	118 00
L. M. Waldner	Axeman	2 00 per day	116 00	2 44	118 44
R. B. Curry	Axeman	2 00 per day	188 00	....	188 00
E. F. Dowd	Axeman	2 00 per day	622 00	....	622 00
Wm. F. Lysett	Axeman	2 00 per day	636 00	63 20	699 20
Geo. E. Merry	Axeman	2 00 per day	634 00	55 13	689 13
Chas. J. Donaher	Axeman	2 00 per day	636 00	4 78	640 78
Hugh F. Lynch	Axeman	2 00 per day	188 00	....	188 00
L. R. Bickford	Axeman	2 00 per day	188 00	....	188 00
John J. Sullivan	Axeman	2 00 per day	630 00	....	630 00
T. Beaupre	Axeman	2 00 per day	628 00	....	628 00
Jerome J. Brueckel	Axeman	2 00 per day	422 00	....	422 00
Wm. H. Kingston	Axeman	2 00 per day	162 00	....	162 00
Chas. Watson	Axeman	2 00 per day	158 00	17 99	175 99
Martin Courneen	Laborer	2 00 per day	66 00	....	66 00
Frank Covert	Laborer	2 00 per day	68 00	....	68 00
Albert Keesler	Laborer	2 00 per day	66 00	....	66 00
Claude A. Facer	Laborer	2 00 per day	40 00	....	40 00
Thos. Dunn, Jr	Laborer	2 00 per day	40 00	....	40 00
A. Ballow	Laborer	2 00 per day	8 00	....	8 00
John Halpin	Laborer	2 00 per day	66 00	....	66 00
Nelton Stevens	Laborer	2 00 per day	66 00	....	66 00
Fred Petrie	Laborer	2 00 per day	68 00	....	68 00
E. Osborne	Laborer	2 00 per day	8 00	....	8 00
William Childs	Laborer	2 00 per day	66 00	....	66 00
Walter Myers	Laborer	2 00 per day	68 00	....	68 00
Wm. Marshall	Laborer	2 00 per day	68 00	....	68 00
James Gleason	Laborer	2 00 per day	68 00	....	68 00
Fred Smith	Laborer	2 00 per day	68 00	....	68 00
George Davis	Laborer	2 00 per day	68 00	....	68 00
David H. Mann, Jr	Laborer	2 00 per day	66 00	....	66 00
Wm. H. Saunders	Laborer	2 00 per day	302 00	....	302 00
C. N. Budlong	Laborer	2 00 per day	406 00	....	406 00
W. B. Green	Laborer	2 00 per day	344 00	....	344 00
E. Horsewell	Laborer	2 00 per day	20 00	....	20 00
Peter Arnold	Laborer	2 00 per day	1,104 00	....	1,104 00
Henry Engler	Laborer	2 00 per day	314 00	....	314 00
Louis J. Mayne	Laborer	2 00 per day	314 00	....	314 00
W. D. Heffernan	Laborer	2 00 per day	62 00	....	62 00
Timothy Driscoll	Laborer	2 00 per day	4 00	....	4 00
M. Madden	Laborer	2 00 per day	66 00	....	66 00
J. B. Roberts	Laborer	2 00 per day	262 00	....	262 00
Jos. McNamara	Laborer	2 00 per day	90 00	....	90 00
L. V. Dunham	Laborer	2 00 per day	178 00	....	178 00
L. C. Pelton	Laborer	2 00 per day	364 00	....	364 00
E. A. Brooks	Laborer	2 00 per day	240 00	....	240 00
Steve Childs	Laborer	2 00 per day	194 00	....	194 00
C. A. Harwick	Laborer	2 00 per day	168 00	....	168 00
Frank Bond	Laborer	2 00 per day	498 00	....	498 00
John Green	Laborer	2 00 per day	170 00	....	170 00
Alexander Rogers	Laborer	2 00 per day	170 00	....	170 00
Carl F. Doty	Laborer	2 00 per day	210 00	....	210 00
F. C. Jordan	Laborer	2 00 per day	210 00	....	210 00

Construction of Barge Canal — Erie Canal — (Concluded).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Wm. O'Day	Laborer	$2 00 per day	$170 00		$170 00
John C. Hoctor	Laborer	2 00 per day	170 00		170 00
Peter F. Poland	Laborer	2 00 per day	52 00		52 00
A. R. Jones	Laborer	2 00 per day	164 00		164 00
O. M. Punch	Laborer	2 00 per day	210 00		210 00
B. S. Wilcox	Laborer	2 00 per day	140 00		140 00
James Hughes	Laborer	2 00 per day	170 00		170 00
Thos. Bushnell	Laborer	2 00 per day	170 00		170 00
Thos. Clifford	Laborer	2 00 per day	170 00		170 00
Nick Gallo	Laborer	2 00 per day	47 25		47 25
Carl L. Oelkers	Laborer	2 00 per day	148 00		148 00
Duane M. Ward	Laborer	2 00 per day	140 00		140 00
Joseph Ricard	Laborer	2 00 per day	170 00		170 00
George Murphy	Laborer	2 00 per day	170 00		170 00
Frank McMahon	Laborer	2 00 per day	170 00		170 00
Edward L. Kropp	Laborer	2 00 per day	104 00		104 00
Howard F. Lewis	Laborer	2 00 per day	54 00		54 00
J. H. Madigan	Laborer	2 00 per day	100 00		100 00
Chas. Blackwood	Laborer	2 00 per day	172 00		172 00
Jay Westbrook	Laborer	2 00 per day	170 00		170 00
Michael Unger	Laborer	2 00 per day	586 00		586 00
M. C. Rutherford	Laborer	2 00 per day	98 00		98 00
Leo. G. Barnhart	Laborer	2 00 per day	170 00		170 00
J. W. Main	Laborer	2 00 per day	150 00		150 00
J. W. Howard	Laborer	2 00 per day	34 00		34 00
Ed. J. Burns	Laborer	2 00 per day	170 00		170 00
Frederick Wood	Laborer	2 00 per day	170 00		170 00
Frank L. Swift	Laborer	2 00 per day	170 00		170 00
Raymond Welter	Laborer	2 00 per day	170 00		170 00
O. W. Hard	Laborer	2 00 per day	164 00	$2 98	166 98
Geo. H. Salsbury	Laborer	2 00 per day	136 00		136 00
John W. Smith	Laborer	2 00 per day	150 00		150 00
R. A. Toole	Laborer	2 00 per day	106 00		106 00
Thos. Dunn	Laborer	2 00 per day	34 00		34 00
David Barry	Laborer	2 00 per day	168 00		168 00
Edwin B. Male	Laborer	2 00 per day	170 00		170 00
Fred Schmitt	Laborer	2 00 per day	170 00		170 00
Jacob Snell, Jr	Gage reader	6 00 per month	72 00		72 00
Wm. J. Swartz	Gage reader	5 00 per month	60 00		60 00
Carl Tuscher	Gage reader	5 00 per month	60 00		60 00
C. Henry Harrison	Gage reader	5 00 per month	60 00		60 00
John F. Wickham	Gage reader	5 00 per month	40 00		40 00
Martin Hunkley	Gage reader	5 00 per month	60 00		60 00
Patrick J. Slavin	Gage reader	5 00 per month	30 00		30 00
					$167,635 58

Incidental Expenses.

Instruments, tools and appliances	$1,106 44	
Office rent	2,450 33	
Fuel and light	229 63	
Stationery and printing	331 61	
Postage	326 07	
Telephone and telegraph	1,132 16	
Miscellaneous	13,186 26	
		18,762 50
Total		$186,398 08

Improvement of Public Highways.

Chapter 115, Laws of 1898, and amendatory laws.

(From October 1, 1908, to February 17, 1909.)

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
John P. Kelly	Division engineer	$300 00 per month		$649 37	$649 37
M. W. Wilbur	First resident engineer	225 00 per month	$361 61	37 60	399 21
James E. Kelley	Resident engineer	200 00 per month	42 86	5 00	47 86
Geo. T. Keith	Resident engineer	200 00 per month	921 43	57 67	979 10
D. D. Waldo	Resident engineer	200 00 per month	400 00	32 58	432 58
Chas. M. Edwards	First assistant engineer	7 00 per day	525 00	10 14	535 14
John S. Clancy	Assistant engineer	6 00 per day	552 00	61 55	613 55
Frank W. Bristow	Assistant engineer	6 00 per day	246 00	16 50	262 50
G. A. Ensign	Assistant engineer	6 00 per day	720 00	39 56	759 56
J. Seward Summers	Assistant engineer	6 00 per day	24 00	......	24 00
J. H. Huber	Assistant engineer	6 00 per day	384 00	14 51	398 51
John Philo Kelly	Assistant engineer	6 00 per day	648 00	108 67	756 67
M. S. Smith	Assistant engineer	6 00 per day	492 00	17 65	509 65
Wm. C. Perkins	Assistant engineer	6 00 per day	492 00	132 03	624 03
Wilson G. Harger	Assistant engineer	6 00 per day	726 00	31 32	757 32
Geo. C. Mills	Assistant engineer	6 00 per day	174 00	20 71	194 71
A. L. Simmons	Assistant engineer	6 00 per day	156 00	167 8	323 86
James T. Schuyler	Assistant engineer	5 00 per day	405 00	140 57	545 57
Hall Gleason	Assistant engineer	5 00 per day	465 00	1 30	466 30
Smith O. Heere	Assistant engineer	5 00 per day	500 00	174 21	674 21
Martin A. Finch	Assistant engineer	5 00 per day	325 00	25 66	350 66
Joe R. Rogers	Assistant engineer	5 00 per day	340 00	66 40	406 40
M. W. Williams	Assistant engineer	5 00 per day	365 00	34 05	399 05
Frank T. Townsend	Assistant engineer	5 00 per day	600 00	27 26	627 26
E. P. Strowger	Assistant engineer	5 00 per day	340 00	23 35	363 35
J. B. Barrett	Leveler	5 00 per day	525 00	......	525 00
J. K. Browne	Leveler	5 00 per day	130 00	......	130 00
A. R. Erskine	Leveler	5 00 per day	135 00	9 70	144 70
W. G. White	Leveler	4 50 per day	553 50	17 36	570 86
W. T. Huber	Leveler	4 50 per day	306 00	216 80	522 80
E. E. Kidder	Leveler	4 50 per day	238 50	6 50	245 00
L. R. Barnes	Leveler	4 50 per day	319 50	27 68	347 18
W. H. Clawson	Leveler	4 50 per day	117 00	29 07	146 07
L. A. McSweeney	Inspector of highways	4 50 per day	184 50	2 62	187 12
Geo. F. Polnan	Inspector of highways	4 50 per day	364 50	1 40	365 90
C. H. Fosdick	Inspector of highways	4 50 per day	558 00	41 08	599 08
Thos. J. Love	Inspector of highways	4 50 per day	567 00	......	567 00
Geo. A. Wright	Inspector of highways	3 50 per day	437 50	11 34	448 84
Chas. F. Swain	Inspector of highways	3 50 per day	413 00	......	413 00
L. S. Webster	Inspector of highways	3 50 per day	420 00	78	420 78
John A. Harold	Inspector of highways	3 50 per day	360 00	......	360 00
Edward M. Polnan	Inspector of highways	3 50 per day	334 00	13 85	347 85
E. M. Secrist	Inspector of highways	3 50 per day	409 50	7 82	417 32
J. F. Hussey	Inspector of highways	3 50 per day	7 00	1 60	8 60
Chas. D. Wagar	Inspector of highways	3 50 per day	455 00	31 96	486 96
C. A. Rice	Inspector of highways	3 50 per day	455 00	10 80	465 80
Harvey G. Eckler	Inspector of highways	3 50 per day	423 50	......	423 50
R. B. Everts	Inspector of highways	3 50 per day	427 00	......	427 00
Glen E. Bates	Inspector of highways	3 50 per day	420 00	1 13	421 13
Jas. S. Douglass Jr.	Inspector of highways	3 50 per day	427 00	......	427 00
Geo. W. Rogers	Inspector of highways	3 50 per day	441 00	31 65	472 65
H. B. Harrison	Inspector of highways	3 50 per day	420 00	......	420 00
Edward P. Boyle	Inspector of highways	3 50 per day	492 00	......	492 50
Alex. Gauthier	Inspector of highways	3 50 per day	154 00	......	154 00
Grant A. Tibbals	Inspector of highways	3 50 per day	168 00	......	168 00
H. G. McKelvey	Draftsman	5 00 per day	665 00	59 20	724 20
E. A. Bonney	Draftsman	5 00 per day	405 00	3 83	408 83
Tracy B. Smith	Draftsman	5 00 per day	315 00	7 10	322 10
B. E. Moses	Draftsman	5 00 per day	600 00	1 60	601 60
C. E. Elmendorf	Draftsman	4 00 per day	320 00	......	320 00
Thos. S. Bailey	Draftsman	4 00 per day	144 00	......	144 00
C. W. Brown	Draftsman	4 00 per day	488 00	......	488 00
J. V. Hogan	Draftsman	4 00 per day	212 00	......	212 00
H. S. Brokaw	Draftsman	4 00 per day	104 00	......	104 00
Wm. J. Burns	Tracer	50 00 per month	150 00	......	150 00
Jos. W. Howe	Rodman	4 00 per day	164 00	48 14	212 14
C. M. Colony	Rodman	4 00 per day	144 00	......	144 00
A. O. Peabody	Rodman	3 50 per day	175 00	......	175 00
H. R. Holmes	Rodman	3 50 per day	129 50	......	129 50
W. H. Ginnity	Rodman	3 50 per day	241 50	......	241 50
Philip B. Hoge	Rodman	3 50 per day	357 00	......	357 00
R. W. Heerlein	Rodman	3 50 per day	259 00	16 79	275 79
R. C. Georger	Rodman	3 50 per day	94 50	......	94 50
Harry R. Tripp	Rodman	3 50 per day	126 00	......	126 00

Improvement of Public Highways — (Concluded).

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. J. Simmelink	Rodman	$3 50 per day	$35 00	....	$35 00
Geo. Fuller	Rodman	3 50 per day	94 50	....	94 50
D. T. Simpson	Chainman	3 00 per day	9 00	....	9 00
J. F. Webster	Chainman	2 50 per day	67 50	....	67 50
Thos. E. McCarthy	Chainman	2 50 per day	95 00	....	95 00
W. N. Longworthy	Chainman	2 50 per day	110 00	....	110 00
Jas. M. Wilson	Chainman	2 50 per day	97 50	....	97 50
C. L. Gorman	Chainman	2 50 per day	65 00	....	65 00
Peter Sheridan	Financial clerk	5 00 per day	230 00	$35 73	265 73
A. B. Williams	Estimate clerk	126 00 per month	189 00	....	189 00
Geo. Davis	Axeman	2 00 per day	34 00	....	34 00
R. B. Curry	Axeman	2 00 per day	52 00	....	52 00
Hugh F. Lynch	Axeman	2 00 per day	52 00	....	52 00
L. R. Bickford	Axeman	2 00 per day	52 00	....	52 00
W. H. Kingston	Axeman	2 00 per day	52 00	....	52 00
E. M. Faller	Axeman	2 00 per day	158 00	8 98	166 98
H. A. Ingersoll	Axeman	2 00 per day	76 00	....	76 00
A. F. Bechtold	Axeman	2 00 per day	58 00	....	58 00
Wm. J. Knauer	Axeman	2 00 per day	94 00	....	94 00
Chas. Watson	Axeman	2 00 per day	66 00	....	66 00
Wm. E. McCarthy	Axeman	2 00 per day	130 00	....	130 00
H. R. Breese	Axeman	2 00 per day	248 00	24 70	272 70
A.W. Balliett	Axeman	2 00 per day	6 00	....	6 00
T. J. Smith	Axeman	2 00 per day	196 00	3 55	199 55
John A. Kelly	Axeman	2 00 per day	150 00	....	150 00
Harry F. Remde	Axeman	2 00 per day	250 00	....	250 00
Wm. Flattery	Axeman	2 00 per day	240 00	....	240 00
John J. Mullen	Axeman	2 00 per day	88 00	....	88 00
Fred M. Douglass	Axeman	2 00 per day	242 00	....	242 00
Earle J. Trimble	Axeman	2 00 per day	82 00	....	82 00
L. M. Waldner	Axeman	2 00 per day	124 00	....	124 00
Sherman A. Miller	Axeman	2 00 per day	74 00	....	74 00
F. J. Fitzmartin	Axeman	2 00 per day	224 00	....	224 00
Finla L. Jones	Axeman	2 00 per day	74 00	....	74 00
Ray L. Kelly	Axeman	2 00 per day	74 00	....	74 00
H. W. Driher	Axeman	2 00 per day	250 00	2 70	252 70
Roy S. Barton	Axeman	2 00 per day	252 00	....	252 00
Louis H. Brandt	Axeman	2 00 per day	158 00	....	158 00
F. H. Carroll	Axeman	2 00 per day	158 00	....	158 00
I. J. Brueckel	Axeman	2 00 per day	152 00	....	152 00
E. S. Collins	Axeman	2 00 per day	266 00	1 42	267 42
Thos. E. Plunket	Axeman	2 00 per day	80 00	....	80 00
H. Archie Shafer	Axeman	2 00 per day	78 00	....	78 00
F. G. Hempel	Axeman	2 00 per day	72 00	....	72 00
W. J. Ward	Axeman	2 00 per day	6 00	....	6 00
R. A. Gross	Axeman	2 00 per day	70 00	75	70 75
G. J. Seemueller	Axeman	2 00 per day	170 00	5 31	175 31
R. T. Dempsey	Axeman	2 00 per day	242 00	....	242 00
Fred Kimball	Axeman	2 00 per day	132 00	....	132 00
J. J. Kinney	Axeman	2 00 per day	128 00	....	128 00
O. W. Hard	Laborer	2 00 per day	72 00	....	72 00
T. Reilly	Laborer	2 00 per day	168 00	....	168 00
Albert C. Burke	Laborer	2 00 per day	10 00	....	10 00
R. A. Toole	Laborer	2 00 per day	10 00	....	10 00
Thos. Shanahan	Laborer	2 00 per day	144 00	....	144 00
Jos. McLaughlin	Laborer	2 00 per day	162 00	....	162 00
Frank Murtaugh	Laborer	2 00 per day	102 00	....	102 00
Frank McMahon	Laborer	2 00 per day	2 00	....	2 00
E. J. Hemeister	Laborer	2 00 per day	158 00	....	158 00
Tim Driscoll	Laborer	2 00 per day	80 00	....	80 00
W. D. Heffernan	Laborer	2 00 per day	84 00	....	84 00
John Shine	Laborer	2 00 per day	176 00	....	176 00
					$35,809 86

Incidental Expenses.

Stationery and printing	$25 30	
Livery	1,589 25	
Fuel and light	51 99	
Postage	83 95	
Office rent	470 42	
Telephone and telegraph	617 40	
Miscellaneous	1,083 46	
		3,921 77
Total		$39,731 63

Allen Street Bridge, Rochester.

Chapter 291, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Chas. M. Edwards	First assistant engineer	$7 00 per day	$427 00	$0 30	$427 30
M. S. Smith	Assistant engineer	6 00 per day	654 00	4 90	658 90
E. P. Strowger	Assistant engineer	5 00 per day	595 00	2 20	597 20
Tracy B. Smith	Draftsman	5 00 per day	590 00	....	590 00
E. A. Bonney	Draftsman	5 00 per day	130 00	....	130 00
Harry H. Tripp	Rodman	3 50 per day	182 00	....	182 00
F. H. Carroll	Axeman	2 00 per day	156 00	....	156 00
F. G. Kimball	Axeman	2 00 per day	26 00	....	26 00
John Bartholomew	Bridge designer	175 00 per month	325 73	....	325 73
G. W. Purvey	Bridge designer	150 00 per month	67 74	....	67 74
R. M. Wheeler	Bridge draftsman	110 00 per month	540 00	....	540 00
A. C. Miller	Bridge draftsman	110 00 per month	110 00	....	110 00
Geo. E. Maynard	Bridge draftsman	110 00 per month	42 58	....	42 58
					$3,853 45
Incidental Expenses.					
Telephone and telegraph				$2 45	
Miscellaneous				90 70	
					93 15
Total					$3,946 60

Lyell Avenue Bridge, Rochester.

Chapter 287, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
Chas. M. Edwards	First assistant engineer	$7 00 per day	$469 00	$1 40	$470 40
E. P. Strowger	Assistant engineer	5 00 per day	700 00	22 95	722 95
John Bartholomew	Bridge designer	175 00 per month	780 44	....	780 44
A. G. Hayden	Bridge designer	160 00 per month	304 00	....	304 00
E. G. Semon	Bridge designer	125 00 per month	143 81	....	143 81
G. M. Braune	Bridge designer	175 00 per month	40 83	....	40 83
R. C. Bastress	Bridge designer	150 00 per month	33 87	....	33 87
R. M. Wheeler	Bridge draftsman	110 00 per month	110 00	....	110 00
G. E. Maynard	Bridge draftsman	110 00 per month	66 00	....	66 00
W. P. Falkenstein	Bridge draftsmen	110 00 per month	209 00	....	209 00
A. C. Miller	Bridge draftsman	100 00 per month	69 76	....	69 76
E. F. Blake	Mechanical engineer	175 00 per month	113 65	....	113 65
C. P. Wiweke	Mechanical draftsman	75 00 per month	48 39	....	48 39
W. S. Klos	Mechanical draftsman	75 00 per month	7 50	....	7 50
J. L. Southworth	Engineering draftsman	4 00 per day	20 00	....	20 00
Tracy B. Smith	Draftsman	5 00 per day	470 00	....	470 00
Geo. L. Knott	Tracer	50 00 per month	20 00	....	20 00
F. H Carroll	Axeman	2 00 per day	26 00	....	26 00
Fred Kimball	Axeman	2 00 per day	126 00	....	126 00
					$3,782 60
Incidental Expenses.					
Office rent				$11 00	
Miscellaneous				286 62	
					297 62
Total					$4,080 22

Surveys for State Court of Claims.

Chapter 568, Laws of 1907.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
T. W. Barrally	Division engineer	$300 00 per month	....	$19 01	$19 01
Frank T. Marsh	Assistant engineer	6 00 per day	$24 00	86	24 86
A. S. Whitbeck	Assistant engineer	6 00 per day	36 00	6 30	42 36
B. L. G. Rees	Assistant engineer	5 00 per day	55 00	25 41	80 41
Chas. R. Zorsch	Draftsman	4 50 per day	....	3 40	3 40
Tracy B. Smith	Draftsman	5 00 per day	110 00	1 70	111 70
J. V Hogan	Draftsman	4 00 per day	28 00	....	28 00
Chas. H. Swain	Inspector	3 50 per day	7 00	....	7 00
S. A. Miller	Axeman	2 00 per day	8 00	....	8 00
H. W. Paton	Axeman	2 00 per day	8 00	....	8 00
A. E. Williams	Axeman	2 00 per day	14 00	....	14 00
Total	....	....	....	....	$346 74

Georgia Street Bridge, Buffalo.

Chapter 452, Laws of 1909.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
B. L. G. Rees	Assistant engineer	$5 00 per day	$55 00	$28 98	$83 98
E. J. Doyle	Assistant engineer	6 00 per day	30 00	....	30 00
Harold Levy	Bridge designer	175 00 per month	34 25	....	34 25
A. G. Hayden	Bridge designer	160 00 per month	160 00	....	160 00
Geo. E. Maynard	Bridge draftsman	125 00 per month	16 67	....	16 67
Leo. Freitag	Bridge draftsman	100 00 per month	16 13	....	16 13
J. Malcom Angus	Bridge draftsman	100 00 per month	3 33	....	3 33
John F. Blaise	Junior bridge draftsman	75 00 per month	49 84	....	49 84
J. V. Hogan	Draftsman	4 00 per day	12 00	....	12 00
R. J. Curran	Tracer	75 00 per month	7 50	....	7 50
Total	....	....	....	....	$413 70

Dresden Boat Landing and Pier.

Chapter 266, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
C. E. Elmendorf	Draftsman	$4 00 per day	....	$3 14	$3 14
Glen E. Bates	Inspector	3 50 per day	....	6 94	6 94
					$10 08
Incidental Expenses.					
Postage				$0 16	
Telephone and telegraph				30	
Miscellaneous				35	81
Total					$10 89

Lighthouse, Keuka Lake Outlet.

Chapter 266, Laws of 1908.

NAME.	Rank.	Rate of compensation.	Services.	Travel.	Total.
H. G. McKelvey......	Draftsman.....................	$5 00 per day	....	$1 66	$1 66
Glen E. Bates	Inspector....................	3 50 per day	....	2 21	2 21
					$3 87
Incidental Expenses.					
Postage..				$0 20	
Miscellaneous..				50	
					70
Total..					$4 57

SUMMARY.

The foregoing tables are summarized as follows:

Ordinary Repairs to Canals.

Erie canal, chapter 465, Laws of 1908..................................	$8,408 36

Construction of Barge Canal.

2 Construction of Barge canal, Erie canal, chapter 147, Laws of 1903.......	186,398 08

Improvement of Public Highways.

Improvement of public highways, chapter 115, Laws of 1898.............	39,731 68

Special Work.

4 Allen street bridge, Rochester, chapter 291, Laws of 1908................	3,946 60
5 Lyell avenue bridge, Rochester, chapter 287, Laws of 1908...............	4,080 22

Special Surveys.

Surveys for State Court of Claims, chapter 568, Laws of 1907............	346 74
Georgia street bridge, Buffalo, chapter 452, Laws of 1909................	413 70
Dresden boat landing and pier, chapter 266, Laws of 1908...............	10 89
Lighthouse, Keuka lake outlet, chapter 266, Laws of 1908...............	4 57
Total...	$243,340 79

TABLE OF CONTRACTS COMPLETED ON THE WESTERN DIVISION DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1909.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Contract price.	Final payment.
			Chapter.	Year.		
W. J. Burns Co.	Dec. 16, 1908	Lyell avenue bridge	287	1908	$30,970 40	$31,336 64

TABLE OF CONTRACTS COMPLETED ON THE WESTERN DIVISION DURING THE FISCAL YEAR ENDED SEPTEMBER 30, 1909 — (Continued).

Improvement of Public Highways.

Chapter 115, Laws of 1898, and amendatory laws.
(Completed between October 1, 1908, and February 17, 1909.)

CONTRACTOR.	Date of contract.	Character of work.	Contract price.	Final payment.
Frederick A. Brotsch	July 11, 1906	Chili (section 1) road, No. 254, Monroe county	$19,400 00	$26,667 63
Frederick A. Brotsch	July 11, 1906	Chili (section 2) road, No. 255, Monroe county	16,070 00	20,808 54
Monroe Roads Co.	Sept. 17, 1907	Clover street (section 1) road, No. 294, Monroe county	40,475 34	40,895 61
Bennett & Ryan	Mar. 9, 1908	Wellsburg road, No. 355, Chemung county	54,176 85	54,396 73
Casey & Murray	Dec. 2, 1907	Horseheads-Corning road, No. 358, Chemung county	77,954 40	77,159 39
Gantz-Wilson Construction Co.	July 18, 1906	Clinton street (section 1) road, No. 371, Erie county	45,925 00	153,996 03
Gantz-Wilson Construction Co.	July 18, 1906	Clinton street (section 2) road, No. 372, Erie county	52,995 00	119,578 04
Baldwin Construction Co.	July 9, 1906	Goodrich road, No. 373, Erie county	69,197 00	73,001 56
Thomas Hucknell	Aug. 31, 1906	Five Corners-Kuckville (section 2) road, No. 387, Orleans county	36,935 00	37,162 38
Jeremiah T. Finch	Sept. 19, 1907	Latta road, No. 399, Monroe county	72,004 95	78,077 22
Greece Construction Co.	Dec. 4, 1907	Buffalo (section 3) road, No. 402, Monroe county	24,805 65	26,145 92
Rockefeller Brothers	Nov. 26, 1907	Churchville-Riga road, No. 403, Monroe county	17,412 60	19,602 53
A. J. Rockwood	Nov. 26, 1907	Clover street (section 2) road, No. 474, Monroe county	14,695 55	16,899 26
Henry P. Burgard Co.	Jan. 20, 1908	West Bloomfield-Honeoye Falls road, No. 485, Ontario county	30,000 00	30,149 46
Mosier & Summers	Sept. 17, 1907	North Collins-Lawton road, No. 524, Erie county	64,585 65	65,857 26
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Lawton-Gowanda road, No. 525, Erie county	44,446 80	35,726 95
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Alden-Town line, Clinton street-Marilla road, No. 529, Erie county	45,596 90	45,327 77
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Base Line-Grand Island (section 1) road, No. 530, Erie county	13,077 55	12,911 93
Stewart-Kerbaugh-Shanley Co.	Dec. 18, 1907	Base Line-Grand Island (section 2) road, No. 531, Erie county	18,194 65	17,766 00
Stewart-Kerbaugh-Shanley Co.	Dec. 18, 1907	Base Line-Grand Island (section 3) road, No. 532, Erie county	10,425 35	10,199 03
Henry P. Burgard Co.	May 7, 1908	Skinnersville-New Home Bridge road, No. 584, Erie county	76,010 70	85,533 71
Gantz-Wilson Construction Co.	Sept. 24, 1907	Olean-Allegany (sections 1 and 2) road, No. 601, Cattaraugus county	35,963 19	31,349 95
Gantz-Wilson Construction Co.	Dec. 18, 1907	Mancester-Clifton Springs road, No. 607, Ontario county	26,503 25	26,438 87
Gantz-Wilson Construction Co.	Dec. 18, 1907	Phelps-Clifton Springs road, No. 608, Ontario county	14,977 08	14,670 16
Stewart-Kerbaugh-Shanley Co.	Sept. 20, 1907	Lewiston-Dickersonville road, No. 617, Niagara county	32,330 35	32,048 23
Stewart-Kerbaugh-Shanley Co.	Dec. 18, 1907	North Tonawanda-Sanborn road, No. 643, Niagara county	39,839 40	38,899 63
E. M. Love & Son	Feb. 5, 1908	Falconer-Kennedy road, No. 698, Chautauqua county	9,845 70	9,115 95
Star Construction Co.	Jan. 30, 1908	Portville-Olean (section 2) road, No. 731, Cattaraugus county	19,619 50	20,994 02
Bradley & Nolan	Jan. 30, 1908	Big Flats-Gibson road, No. 742, Steuben county	48,185 43	49,706 33

TABLE OF CONTRACTS PENDING ON THE WESTERN DIVISION, SEPTEMBER 30, 1909.

CONTRACTOR.	Date of contract.	Character of work.	ACT.		Engineer's preliminary estimate.	Contract price.	Payments to September 30, 1909.
			Chapter.	Year.			
William T. McKibben Co.	Jan. 15, 1909	Allen street bridge, Rochester	291	1908	$30,703 00	$26,708 40	$17,842 50

Report to the Senate by the State Engineer on the Proposition to Increase the Cayuga and Seneca Canal to Barge Canal Dimensions.

STATE OF NEW YORK,
OFFICE OF THE STATE ENGINEER AND SURVEYOR,
ALBANY, *March* 27, 1909.

To the Honorable, The Senate of the State of New York:

I have the honor to submit herewith my report in accordance with the following resolution of the Senate, dated February 4, 1909:

> "*Whereas,* The State Superintendent of Public Works, Honorable F. C. Stevens, in his annual report just submitted to the Legislature, has called attention to the advantage and importance of improving the outlets of Cayuga and Seneca lakes, rendering these lakes and their outlets a part of the Barge canal system, and has pointed to the fact that such a project is rendered the more easy of accomplishment by reason of the change in alignment already made in the improved Erie canal as authorized by Chapter 710 of the Laws of 1907; and
>
> *Whereas,* The Superintendent of Public Works has recommended definite and favorable action looking to the authorization of such improvement, Therefore, be it
>
> *Resolved,* That the Superintendent of Public Works and the State Engineer and Surveyor be, and they hereby are requested to furnish the Senate at as early a date as is possible such information and such specific data as can be provided by them bearing upon the probable cost of construction, including land damages, and bearing also on the length of time which would be consumed in making such improvement, as will enable this body to make an intelligent study of the whole question; and any and all information which they may be pleased to and are able to furnish and which will assist this body in its decision as to what steps, if any, shall be taken for carrying out the recommendations of the Superintendent of Public Works and for authorizing the actual inauguration of such improvement."

The limited time at my disposal has rendered it impossible to make accurate surveys and in arriving at the conclusions which I herewith present, I have made use of such data as I find on file in my office, supplemented by a few hurried surveys and soundings for rock and personal examinations by members of this department.

The proposition naturally divides itself into two parts:

First — That of connecting Cayuga lake with the Barge canal system in process of construction between Buffalo and the Hudson river.

Second — That of connecting Seneca lake with the same system.

I find that in April, 1906, Hon. Henry A. Van Alstyne, State Engineer and Surveyor, in accordance with Chapter 700 of the Laws of 1905, made a survey and completed plans and estimate of cost for extending the Barge canal, as then projected, from a point near Fox Ridge to deep water in Cayuga lake. In 1907 by Chapter 710 the route of the Barge canal was changed so that from Fox Ridge westward it followed the Seneca river to the mouth of the Clyde river, bringing it about five miles nearer the foot of Cayuga lake than was contemplated in the route as laid down by Chapter 147 of the Laws of 1903.

In presenting, therefore, my estimate of cost for the Cayuga canal I have made use of the maps, plans and estimate prepared by Mr. Van Alstyne, from a point on the present Barge canal location near the Montezuma aqueduct to deep water in Cayuga lake.

No extended survey has, up to the present time, been made looking toward the construction of a canal of Barge canal dimensions connecting Seneca lake with the improved canal system. The present Seneca canal extends from Geneva around the foot of Seneca lake, thence following the course of the Seneca river to a junction with the Cayuga canal near Mud Lock at the foot of Cayuga lake. For a part of this distance the Seneca river has been canalized and the remainder of the canal is in artificial channels. The improvement of this canal involves considerable difficulties and in the absence of opportunity for making definite studies of the various situations to be encountered, my estimate at the best can be regarded as only approximate.

From the best information at my disposal I have attempted to determine as nearly as possible the probable amount of work of various classes involved in this construction, and have estimated costs based on similar or nearly similar work as closely as can be determined, which has been contracted for on the line of the present Barge canal improvement. In preparing my estimate, I have had in mind at all times the building of a canal in keeping, in every essential respect, with the type of canal now in process of construction between Buffalo and the Hudson river, believing that it would be a serious error to sacrifice on the Cayuga-Seneca canal, for the sake of economy, the standards of limit of curvature, directness of alignment and stability and completeness of construction established by this department for the Barge canal. I believe that my estimate is sufficient to cover all reasonable contingencies and it could undoubtedly be somewhat reduced if it could be definitely known that the policy of the State authorities would be to close the existing canal for at least one season during the construction of a new channel, and if the materials to be excavated shall be found on further investigation to be susceptible of handling more economically than the necessarily incomplete information which I have at hand indicates. Only a careful investigation by borings can accurately determine this latter point.

The dimensions of the prism and various structures provided by my estimate for the Cayuga and Seneca canals are based on the standards for corresponding construction now employed on the Barge canal. Working under such standards, I have estimated various sections of the canal prism to have a minimum depth of twelve feet of water, and widths as follows:

	Bottom width
From the Barge canal near the Montezuma aqueduct to Cayuga lake .... minimum	100 ft.
Along the east shore of Cayuga lake.................	75 ft.
From east shore of Cayuga lake to deep water in the lake	75 ft.
From the Seneca river at the foot of Cayuga lake to proposed lock near the foot of the Seneca river gorge just west of the bridge of the N. Y. C. R. R., Auburn branch .... minimum	75 ft.
From foot of Seneca river gorge to Seneca lake, excepting where vertical wall is used...................	75 ft.
Sections between vertical walls.....................	94 ft.

All locks to be of the standard Barge canal type, having the following interior dimensions:

Width of chamber	45 ft.
Length between hollow quoins	328 ft.

The location and lifts of the various locks to be as follows:

On Cayuga canal between Barge canal and deep water in Cayuga lake.

(1) Lock at foot of Cayuga lake, lift 7½ ft.

On Seneca canal between foot of Cayuga lake and Seneca lake.

(1) Lock near New York Central railroad bridge, lift 19 ft.
(2) Lock near the Rumsey Pump Works, Seneca Falls, lift 9½ ft.
(3) Lock west of Ovid street, Seneca Falls, lift 28 ft.
(4) Lock combining present locks at Waterloo, lift 14.28 ft.
(5) Guard-lock at foot of Seneca lake.

I have included in my estimate the probable cost of regulating works to be built at the foot of Cayuga lake for maintaining the elevation of the water in that lake between certain limits, the existing regulating works at the foot of Seneca lake to be retained and a new guard-lock of the same dimensions as similar locks on the Barge canal to be built at that point. As it is not contemplated that boats on these proposed improved canals will be propelled by animal power, no provision has been made for a towing-path.

Owing to the heavy cost which would be entailed in reconstructing the existing land-line canal, extending from the head of the Seneca river around the foot of Seneca lake, I do not think that such reconstruction is warranted, and propose that boats enter Seneca lake directly from the canal at the head of the Seneca river, from which point it will be practicable to reach any point on the lake, including the harbor at Geneva, and this change from the present canal line will entail no difficulty upon boatmen inasmuch as methods of propulsion applicable to the new form of canal would as readily be operative upon the lake.

Provision has been made in the estimate for extending the present breakwater at the head of Seneca river so as to form an ample harbor.

An effort has been made to determine the probable cost of the land to be taken for the proposed enlargement and of the probable property damages due to such enlargement, and this has been included in my estimate. It is, however, practically impossible to determine with any degree of accuracy just what such damages may amount to, owing to peculiar conditions existing on some sections of the present canal.

Estimate of cost for constructing proposed canal from near Montezuma aqueduct to deep water in Cayuga lake, a distance of 10.8 miles:

1. Clearing	$800	
2. All excavation	845,140	
3. Locks, spillways, retaining walls, controlling works, etc	446,540	
4. Bridges	58,812	
5. Appropriated lands and damages	10,050	
	$1,361,342	
Add 15 per cent for engineering and contingencies	204,201	
		$1,565,543

Estimate of cost for constructing proposed canal from near Mud Lock at the foot of Cayuga lake via Seneca river to deep water in Seneca lake, a distance of 13.7 miles:

1. Clearing	$20,000	
2. All excavation	2,376,925	
3. Locks, spillways, retaining walls, controlling works, etc.	1,944,800	
4. Bridges	600,000	
5. Appropriated lands and damages	715,000	
6. Maintaining navigation	20,000	
	$5,676,725	
Add 15 per cent for engineering and contingencies	851,508	
		6,528,233
Total		$8,093,776

It is estimated that the proposed Cayuga canal could be completed in three years from the date of beginning construction, and that both canals could be completed within five years of such date.

In order to make surveys and borings from which detailed plans and accurate estimates may be prepared, including contract drawings for such portions of the work as would require to be advertised first, I would recommend that $40,000 be appropriated. This preliminary work would require one year for completion.

I would add that recent examinations have led me to believe that there may be an alternative route providing for an outlet from Seneca lake to a junction with the Barge canal which might be constructed at a less expense than would be involved in canalizing the present Seneca river to Barge canal dimensions, but accurate surveys will be required to definitely determine whether such a line may be found.

Respectfully submitted,

FRANK M. WILLIAMS,
State Engineer and Surveyor.

Report of the Cayuga and Seneca Canal Survey.

ALBANY, N. Y., *October* 1, 1909.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor, Albany, N. Y.:*

Dear Sir.— The following is a report of the work done on the surveys, plans and estimates to October 1, 1909, for the proposed improvement of the Cayuga and Seneca canal:

Chapter 433 of the laws of 1909 provided " for the State Engineer and Surveyor, for detailed survey, estimate and plans, so far as may be necessary for improving the outlets of Cayuga and Seneca lakes so as to render said lakes and their outlets a part of the Barge canal system of the State, the sum of twenty thousand dollars ($20,000.00.)"

Immediately after this act had become a law, about June 1, 1909, a field force was organized with headquarters at Seneca Falls and preliminary surveys and investigations were started, covering the routes called for by Chapter 391, Laws of 1909, entitled —" An act making provision for issuing bonds to the amount of not to exceed seven million dollars for the improvement of the Cayuga and Seneca canals, and providing for a submission of the same to the people to be voted upon at the general election to be held in the year nineteen hundred and nine."

The routes outlined in the above act were as follows:

" The route of the Cayuga canal shall be as follows: Beginning at or near the point where the canal, authorized by Chapter 147 of the Laws of 1903, as amended by Chapter 508 of the Laws of 1908, leaves the Seneca river to follow the course of the Clyde river; thence following the valley of the Seneca river to deep water in Cayuga lake; thence through Cayuga lake to Cayuga lake inlet at Ithaca.

" The route of the Seneca canal shall be as follows: The junction of the Seneca canal with Cayuga canal shall be at such point as may be determined by the Canal Board after surveys of the routes of such proposed canals shall have been made by the State Engineer and submitted to the Canal Board; and from such junction with the Cayuga canal, the Seneca canal shall follow approximately the line of the present Seneca canal in this westerly direction to the present Seneca lake controlling works; thence into and through Seneca lake to Watkins; providing, that in the event the Canal Board shall determine, after surveys have been made by the State Engineer and submitted to the Canal Board, that a divergent route from the foot of Seneca lake at Geneva northerly, connecting the Seneca lake with the Barge Canal at Lyons, or at some point east of Lyons, is more practicable and economical, such divergent route for the Seneca canal shall be chosen, and the Seneca canal constructed along such divergent route."

CAYUGA CANAL FROM BARGE CANAL AT MONTEZUMA TO CAYUGA LAKE.

A survey of this route was made under Chapter 700 of the Laws of 1905 and it was not deemed necessary at this time to make any further surveys along this route, but it was determined to utilize the former surveys and maps in completing plans and estimates for this canal between the above points.

SENECA RIVER ROUTE.

East and West Line.

A survey for this line was tied onto the old survey for the Cayuga canal near Mud Lock and a taped base line was first run along the present towpath of the Seneca canal from Mud Lock to the outlet of Seneca lake near the controlling works, a distance of 13.5 miles. A line of levels was next run between these points and permanent bench-marks established about a quarter of a mile apart. A stadia survey was then made covering the entire valley of the Seneca river between Dumont bridge and Seneca lake and soundings in Seneca river and canal were taken along this line at intervals of 100 feet. This practically completes the survey work on the east and west line with the exception of the line between the so-called Free Bridge over the Seneca river and the Dumont bridge, a distance of 1.9 miles. There also remains to be done certain work in connection with the various structures on this line and one or two proposed side lines, or changes of location.

Wash-drill and rock-drill borings are now being made at the various lock sites and it is proposed later to make both wash-drill and drive-rod soundings along the prism of the canal, to determine the character of material and elevation of rock.

North and South Line.

This route begins at the northern end of Seneca Lake at Geneva, crossing the New York Central railroad tracks east of the railroad station and extending in a northerly direction to a point about one-half mile west of the West Junius railroad station, thence following along the east side of the valley of the Canandaigua outlet for about three miles. From this point two routes are to be surveyed, the first running northeast toward the Pennsylvania Division of the New York Central railroad and crossing it about one-fourth mile south of the Wayne-Ontario county line, thence running north along Pond brook and joining the main line of the Barge canal near Creager's bridge on contract No. 47. The second route follows along the Canadaigua outlet through the village of Alloway and joins the main line of the Barge canal in the village of Lyons.

At the present time the field work on the north and south line is about one-third completed and the topography is being taken by stadia. Wash-drill borings are also being made at various points along this line.

GAGINGS.

Nine river gaging stations were established along the Seneca river and the Cayuga and Seneca lakes early in the summer. These gages are being read twice daily and at Seneca Falls and Waterloo weekly readings are being taken on the water-surface at the upper and lower limits of each water power.

OFFICE WORK.

A field office was established in Seneca Falls in June at the time the surveys were started and the notes are being computed and checked and the maps and profiles made in this office. The topography is being plotted on standard Barge canal sheets to a scale of 100 feet to the inch with 2-foot contours. Cross-sections are being completed and it is the intention to complete all preliminary maps in this office and later forward them to the Albany office where the estimates and plans will be made. This field work has been in immediate charge of L. S. Hulburd, Assistant Engineer. It is expected that most of the field work will be completed about January 1, 1910, and a comparative estimate of the cost of of the different routes will probably be completed by February 15, 1910.

Respectfully submitted,
H. W. DEGRAFF,
Deputy State Engineer.

Report of Tests

Report of the Land Bureau

Report of the Bureau of Bridges

Report of Tests of Concrete Arches — Models of the Medina Aqueduct

REPORT OF TESTS.

TESTING LABORATORY — STATE HALL.

ALBANY, N. Y., *October* 1, 1909.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor:*

Sir.— I have the honor to submit the following report of the work of the testing laboratory of your Department for the fiscal year ended September 30, 1909.

The work of the year has been more than simply routine, for, besides the regular testing of cements, the scope of the laboratory has been extended and tests are now being made of sand as well as cements. Many special tests of considerable variety have made the work of particular interest and value. The inspection of cement at the mills has greatly increased the work of the bureau.

CEMENT TESTS.

The routine work of testing cement has been largely increased during the past year because of the greater amount of work being done upon the Barge canal and upon the public highways. The transfer of highway work to the Highway Commission resulted in the Commission placing the necessary number of men in this laboratory to make the tests on cement proposed for use on the highways. The supervision of their work was left with the undersigned. The work done also includes, as for several years past, a large number of tests made for work under the direction of the State Architect. Although the laboratory has been enlarged several times, the work at times required the full capacity of the laboratory, especially when field work was in full swing during the summer months.

During the past year there have been submitted to this laboratory for tests 971 lots of cement samples, consisting of a total of 16,456 samples. Of the total number of samples tested, 10,668, or 64.8 per cent, were for the Barge canal; 1,888, or 11.5 per cent, were for public highways; and 3,900, or 23.7 per cent, were for the State Architect.

The inspection of cement at the mill permits the taking of a smaller proportion of samples to the number of barrels represented. The total number of barrels of cement tested was 662,126. Most of the cement for the Barge canal was sampled at the mill and 88 per cent of this amount, or 584,651 barrels, were for the canal work. Fifty-four per cent of all the cement tested was made in New York state.

Each sample submitted, mixed in the proportion of one part cement to three parts standard quartz sand, was tested for tensile strength at the ends of 7 and 28 days. In addition to the tests for tensile strength, each lot of samples was given tests for fineness of grinding, for initial and hard sets, and for soundness by means of the steam tests, the normal-water test and the normal-air test. Frequently the cements are completely analyzed and are especially checked for sulphuric anhydride ($S\ O_3$) and magnesia ($Mg\ O$).

Of the cement tested all was Portland cement, except 300 barrels of natural cement. The brands represented by the samples received are about the same as heretofore and consist of 24 American Portland and 2 American natural. Of the brands, 7 were manufactured in New York, 15 in Pennsylvania, and 3 in New Jersey. Two brands of white Portland cement were tested.

During the year 79 series of special tests were made. For these about 1,600 briquettes were made, including 1,424 briquettes which were tested to obtain the results of the various sands with cement. The other tests include several short and long period tests.

A brief description of the method used in making the tests in this laboratory will probably make the results of the tests much better understood as well as more easily comparable with the results obtained in other testing laboratories. The method is practically the same as that recommended by the American Society of Civil Engineers. It is as follows:

Sampling.—After the cement proposed to be used upon any contract work of the State has been delivered and well stored, the engineer in charge, or his representative, takes one sample from every tenth barrel of cement or from the equivalent of the tenth barrel when packed in sacks. Each sample is placed in a double envelope-bag upon which is printed such matter as when filled in by the person taking the sample will give the sample number, brand of cement, date of sampling and work upon which the cement is to be used. About twenty ounces of cement are taken for each sample. The samples are packed firmly and dry in wooden boxes and are then sent by express to this laboratory. Upon receipt here a portion of every sample is taken and these portions are thoroughly mixed into a large general sample. From this mixed sample is taken the cement used in making the tests of fineness, setting qualities, soundness, specific gravity and analysis.

Fineness.— The tests for fineness consist of drying the sample and then weighing on a scale capable of weighing to one ten-thousandth part of a pound a certain amount of the cement. This is carefully sieved through standard sieves of 2,500 and 10,000 meshes to the square inch. The sieving is done by means of a mechanical sifter operated by electricity, but all tests are completed by hand sifting. The residue is weighed and the percentages thus obtained. Ninety-nine per cent of the cement must pass the 2,500-mesh sieve and 92 per cent must pass the 10,000-mesh sieve.

Setting qualities.— From the mixed sample enough is also taken to make a ball of paste for the mould of the Vicat apparatus and for 3 neat pats. This is mixed up into a paste of normal consistency by adding from 18 to 25 per cent, by weight, of water to Portland cements and from 28 to 33 per cent to natural cements. After being thoroughly troweled this paste is moulded into a ball and pressed into the inverted mould and the paste struck off even with the bottom of the mould. It is then turned over and the top struck off even. This is then placed in the moist-air cabinet and tested from time to time by the Vicat needle. To be accepted, Portland cement must not take an initial set in less than 30 minutes or natural cements in less than 20 minutes; Portland cements must not take a hard set in less than an hour or require more than 10 hours to get hard set; natural cements must not take a hard set in less than 30 minutes or require more than 3 hours. The time is estimated from the moment of adding the water to the cement.

Soundness.— That cement paste which is left from the above test is moulded into 3 pats on glass plates about 3 inches by 4 inches in size. These pats are about one-half inch thick in the center and are drawn out to thin edges. As soon as made, the neat pats are placed in a moist-air cabinet and allowed to take their set. When the pats have hardened for 24 hours one is put in the steam of water at 212 degrees Fahr. for 5 hours. This is the "accelerated" or "hot-water" test; and if the pat, after being in the steam for 5 hours, shows no sign of blowing or cracking, it is reported as "good." The other pats are given normal-air and water tests by being kept respectively in air and water maintained at from 60 to 70 degrees Fahr.

Tensile strength — Mortar.— For the tests for tensile strength, each sample is gaged separately with its proper proportion of standard crushed quartz sand, 1 part of cement to 3 parts of sand, parts by weight. As each sample is thus gaged it is put into a small pan and each is kept in the order of its number, so that the samples will not lose their identity. Each separate sample of cement and sand is thoroughly mixed dry and then from 9 to 11 per cent by weight of water is added to Portland cements and from 10 to 13½ per cent by weight to natural cements. The percentage used is such as will give a stiff mortar, which will show up water when the trowel is drawn heavily over it. This mortar is thoroughly troweled and is then put into the moulds.

Briquettes.— The mould, which is of brass and of the standard form recommended by the American Society of Civil Engineers, is first filled with loose mortar and this is carefully compacted by pressing down with the thumbs protected by rubber gloves. More loose mortar is placed in the mould and is pressed down as before. This makes about three-quarters inch of mortar in the mould, having been placed in about three-eighths-inch layers. The top layer is placed by striking a further addition of loose mortar with the back of the trowel. The briquette is then struck off even with the top of the mould. Two briquettes are made from each sample.

Treatment.— As soon as made, the briquettes are placed upon plates of glass and are placed in the moist-air cabinet, care being taken to keep them in their order so as to still retain their identity. After the mortar has hardened, the briquettes are removed from the moulds and replaced in cabinet. Twenty-four hours after gaging they are marked with a number which is given to each briquette consecutively as each is made, and are immersed and kept in water maintained at a temperature of about 60 to 70 degrees Fahr.

Breaking.— On the seventh day after gaging, the first test for tensile strength is given, and 21 days later, or on the 28th day after gaging, the second briquette of each sample is broken for tensile strength. Three improved Fairbanks cement testing machines are used to obtain these results. All the operations are so conducted that there is perfect uniformity in the treatment of all the samples.

Strength.—Portland cements, mixed as described, must show an average of at least 150 pounds per square inch in tensile strength in 7 days and an average of at least 240 pounds per square inch in 28 days. Natural cements, mixed as described, must show a tensile strength of an average of at least 40 pounds per square inch in 7 days and an average of at least 100 pounds per square inch in 28 days.

Neat briquettes.— Tests for tensile strength of neat briquettes are seldom made, as the practice of this Department is to place the greater dependence upon the mortar test. Whenever they are made, however, they are made and treated in a manner similar to that given mortar briquettes, excepting, of course, that a greater percentage of water is used — usually being about 1 per cent less than that used in gaging for the neat pats of that particular lot or brand. Neat briquettes of Portland cement, so made, must show an average of at least 500 pounds per square inch in tensile strength in 7 days; and neat briquettes of natural cement, similarly made, must show an average of at least 150 pounds per square inch in tensile strength in 7 days.

Analysis.— The method of analysis used in examination of cements is that recommended by the committee of the New York Section — Society for Chemical Industry.

Specific gravity.— The tests for specific gravity are made as suggested by the American Society of Civil Engineers — the Le Chatelier apparatus being used as recommended.

Acceptance.— At the end of the 7-day tests, all results obtained on tests of samples of cement proposed for use on Barge canal work are reported to Mr. William B. Landreth, Special Deputy State Engineer, and, if thought best, are held for the 28-day tests, the lots being accepted or rejected according as the results show that the cement passes or fails in the tests. The reports of all tests of cement for all other work (except Barge canal and highway work) are submitted to Mr. H. W. DeGraff, Deputy State Engineer. All reports of tests for the Highway Commission are made to the Engineer in charge of the Bureau of Research.

Our method of testing each sample separately for tensile strength has proven very satisfactory; in fact, by means of it, much poor cement has been discovered which would have stood the tests had all of the samples of the lot been blended. This method, however, makes necessary a larger equipment and a more complete system of operation than is necessary under the general method of testing a blended sample. Although the laboratory was enlarged during the past year, a further enlargement will probably be needed within another year. The effort, however, is made to maintain as complete a laboratory with as little expense as possible; but it is hoped that the laboratory and its results will be so complete as to be placed by experts as being among the best in the country.

The specifications for cement follow closely those recommended by the American Society for Testing Materials — varying from them only in some minor details.

Mill inspection.— In addition to the regular method of sampling, as already described in this report, it has been found advisable to sample cement proposed for use on the Barge canal, at the various mills. When there is enough cement to warrant doing so, an inspector is sent to a cement mill to sample cement and inspect shipments. The method of carrying on this work is as follows: The inspector takes samples from the various parts of the bin; each sample is shipped to the Testing Laboratory at Albany by the same method as described and also is tested in the same way. The endeavor is to obtain from the sampling and the testing of these samples the "run of the product." As soon as the samples are taken the inspector places the bin of cement under the seal of this Department and the bin so sealed that no cement can be added to or taken from the bin without the breaking of the seal. When the results of the tests have been secured, the reports are made in the usual way, and then, if the cement is accepted, the bin of cement is assigned to the contract which may have placed an order for the cement. When the contractor needs cement, the inspector at the mill breaks the seal on the bin, inspects the loading of the car or cars, seals these with the Department seal and then reseals the bin of cement. A notice of shipment is forwarded to the laboratory and the resident engineer in charge of the contract to which the cement has been assigned. When the car or cars arrive on the work, the seal of the Department must be broken by the resident engineer or his representative, otherwise the lot of cement must be sampled and tested in the usual way.

This work of inspection has added considerably to the work of the Testing Laboratory, as an average of five inspectors are continually at this work and it is all done through the laboratory.

SAND TESTS.

The importance of thorough examination and tests of the sands proposed for use on the Barge canal has been practically demonstrated. Seventy-five samples of sand have been tested along the lines of tests established during the previous year. These tests are as follows: The sands are examined under the microscope for those elements that give the sand its characteristics. The other tests are for voids, loam, fineness, or grading, and tensile strength with cement. The latter are made from the sand in its natural condition and also washed; and the cement is a "standard" cement, made by mixing together in the laboratory several brands of cement which run nearly alike in the regular tests. All tests for tensile strength cover at least 28 days, but many long-time tests are being carried.

The "testing of sand" also includes the testing and examination of substitutes for sand, such as screenings and iron ore tailings. Several extended tests of these latter materials have been made.

OTHER TESTS.

In February, 1909, the stone testing was taken charge of by the Highway Commission, when that Commission took over the highway work from the Department of the State Engineer and Surveyor.

Many miscellaneous tests have been conducted in the laboratory. Not the least of these has been a series of tests on concrete cubes, prisms and arches, which has been started and which will be completed in the coming year. Tests and examination of water, wood preservatives, water-proofing and other miscellaneous materials have been made. Laboratory examinations have been aided by inspection on the work, where questions concerning concrete and other materials have arisen. In conclusion it should be stated that not only has the work greatly increased, but the field of the work has also increased.

Respectfully submitted,

RUSSELL S. GREENMAN,
Resident Engineer in charge of Tests.

Report of the Land Bureau of the State Engineer's Department.

ALBANY, *October* 1, 1909.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor:*

Sir.— I have the honor to present herewith a report on the various matters pertaining to the Land Bureau of your Department for the fiscal year ended September 30, 1909.

The Commissioners of the Land Office have applications for grants of land under water which are referred to this Department for examination and report; as are also a large number of miscellaneous matters relating to State lands. These matters require careful inspection and naturally consume a great deal of time.

The maps are examined to determine their correctness and proper form, both from an engineering standpoint and to insure their conformity to the rules and regulations of the Land Office.

In some cases it is also necessary to visit and inspect the locations of the proposed grants to decide as to the advisability of making the grants on the lines of the application, or, if necessary, to have them modified.

It is also at times deemed advisable to deny some of these applications on account of interference with navigation or with the rights of the public.

Some applications were contested or had remonstrances filed against them, and hearings have been necessary to determine the rights of the several interested parties and report the outcome to the Commissioners of the Land Office.

There have been made in this Department, for the use of the State Engineer and Surveyor and the Commissioners of the Land Office, maps showing the lands under water granted by the Commissioners adjacent to the shores of Albany, Columbia, Clinton, Dutchess, Erie, Greene, Jefferson, Kings, Nassau,, Niagara, Onondaga, Orange, Otsego, Queens, Rensselaer, Richmond, Rockland, Suffolk, Ulster and Westchester counties. These maps are brought up to date and are of great value for reference in adjusting land grants. It is desirable that the maps of all sections of the State should be kept up to date in like manner, but through lack of funds this has not been possible.

Thirty-five applications for grants of land under water were considered by this Department during the year. One was for commerce, two for railroad purposes and the remainder for restricted beneficial enjoyment. The lands were in the following counties: Albany, Cayuga, Dutchess, Erie, Greene, Nassau, Otsego, Putnam, Queens, Richmond, Rockland, St. Lawrence, Seneca, Suffolk, Ulster and Westchester.

The State Engineer and Surveyor has sold at public auction *all* of those unappropriated lands of the State which have been ordered to be sold by the Commissioners of the Land Office.

The records of the office show that there were held during the year seventeen public auctions, at which thirty-one parcels of land were sold. The sum of $18,441.50 was realized therefrom.

Of these lands twenty-two parcels were acquired through the Comptroller's tax sales, eight from foreclosures of loan mortgages and one from abandoned canal lands. The lands are located in the following counties: Albany, Essex, Herkimer, Kings, Ontario, Richmond, Rockland, Westchester and Wyoming.

There has been the usual amount of correspondence and answering of inquiries from surveyors, lawyers and others on matters pertaining to the original maps and descriptions of the Colonial and early State surveys filed in this office. The answering of such inquiries often requires much time and study, as there are frequently more than one survey of the same land made at different times by various surveyors, and none should be overlooked. These maps become more valuable as time passes; and as a large part of them are very old and describe lines of tracts of land which have become, in many instances, the boundaries of towns and counties, the value of those records becomes still greater.

For better preserving these records they have been rearranged, placed in bound volumes and indexed for convenience of reference. That it is the proper method for the care of those valuable papers, and that it affords greater facility for finding particular papers with the certainty that none have been overlooked, has already been fully demonstrated.

Respectfully,

MERRITT PECKHAM, JR.,
Assistant Engineer in Charge of Land Bureau.

Report of the Bureau of Bridges.

Albany, N. Y., *October* 1, 1909.

Hon. Frank M. Williams, *State Engineer and Surveyor:*

Sir.— I have the honor to report as follows for the fiscal year ended September 30, 1909:

On October 1, 1908, the total force of this Bureau consisted of 43 men. During the year there has been a gain of 5 and a loss of 18, making the present total force 30. The force now consists of the Chief Bridge Designer, Assistant Chief Bridge Designer, 13 Bridge Designers, 1 Assistant Engineer, 1 Mechanical Engineer, 2 Mechanical Draftsmen, 5 Bridge Draftsmen, 2 Junior Bridge Draftsmen, 1 Engineering Draftsman, 2 Tracers and 1 Office Assistant.

More than 90 per cent of the work in this Bureau during the past year has consisted in the preparation of plans, specifications and estimates of cost for structures to be built in connection with the improvement of the canals as authorized by chapter 147, Laws of 1903. The work done includes plans for some 40 highway bridge superstructures and 20 substructures of the improved type described in my last annual report; also lock-gates, needle-dams and valves for 18 locks; 8 lift guard-gates; 2 sluice-gates, besides much miscellaneous work and many plans now in the process of preparation.

Plans and estimates have been prepared at the request of the Superintendent of Public Works for bascule lift bridges at Allen street and Lyell avenue, Rochester; for a plate girder bridge at Mill street, Cazenovia; for a bascule lift bridge at Seneca street, Utica; for a plate girder bridge at Ovid street, Seneca Falls, and for a through rivetted truss bridge at Georgia street, Buffalo.

It should be noted that the appropriations for the bridges at Lyell avenue, Allen street and Seneca street cover $55,000, $50,000 and $24,000, respectively. Before plans were prepared this Bureau made a careful study of local conditions, disclosing the fact that the span in each instance could very properly be considerably reduced. This was done with the approval of both the State Engineer and the Superintendent of Public Works. As a result, contracts have been awarded at such sums that, allowing for engineering, contingencies, etc., the three bridges will be probably completed for a total of about $35,000 less than the appropriations.

The rolled-steel shapes used for bridge superstructures are rolled at several of the principal steel-mills of the United States and are manufactured into trusses, floor-beams, etc., at the shops of the various bridge companies. On account of the large expense attaching thereto, it has been impracticable for this Bureau to have men in its employ located at the mills and shops for the purpose of making the necessary mill and shop inspection required by the specifications on what are comparatively small amounts of material. Such inspection has, therefore, been regularly made by a firm of inspecting engineers, appointed by the State Engineer and Surveyor. These engineers are able to make the inspection at low cost because their representatives inspect larger quantites of material for other purposes in connection with the materials inspected for the State. Reports of mill and shop inspection are regularly received and upon receipt are carefully examined in detail and placed on file.

Shop-drawings of all structural steel and machinery for new State bridges are submitted by the contractors for approval before any shop-work is done. These drawings are carefully examined and are approved after having been corrected to conform with the requirements of the contract-drawings and specifications.

During the session of the Legislature many approximate estimates of cost were made for various bridges and steel structures provided for by those bills which were referred to the State Engineer.

During the year existing bridges over the canals have been examined at the request of the Superintendent of Public Works. Reports as to the condition of these bridges, with recommendations as to necessary repairs, have been made to the State Engineer. Plans for strengthening existing bridges or for building new bridges over the canals, submitted to the Superintendent of

Public Works by street-railway companies in connection with petitions for permission to cross the canal, have been carefully examined and reports made thereon to the State Engineer.

Constant effort has been made to do the work assigned to this Bureau with promptness and at as low a cost as is consistent therewith.

Respectfully submitted,

WM. R. DAVIS,
Chief Bridge Designer and Inspector.

APPENDED REPORT.

Immediately following is a report by the Chief Bridge Designer of a series of tests made under his supervision and that of the Resident Engineer in charge of the testing laboratory.

Report of Tests of Concrete Arches — Models of the Medina Aqueduct.

At Medina the Barge canal will cross a deep gorge and the topography is such that this cannot be avoided. After a careful consideration of various types of steel and concrete aqueducts and also a high earth embankment, it was decided by the State Engineer and the Advisory Board of Consulting Engineers, that a concrete arch of single span, carrying a reinforced concrete trunk with the necessary approaches, is to be preferred to other possible types of construction.

The load to be carried consists of a prism of water, having a maximum depth of 13 feet 2 inches, and weighing 825 pounds per square foot, in addition to the weight of the trough, piers and arch ring. The total weight of water to be carried by the single span is 12,400 tons, while the total load, including the weight of the structure, is 46,000 tons. The water load may at times be removed, and is to this extent a live load, although it is always uniform for the full length of the structure and is never accompanied by impact.

The span, center to center, is 290 feet 6 inches. The clear span of 285 feet cannot properly be reduced. The rise is 53 feet 5 inches. The total width of the structure is 129 feet.

Other notably long span concrete arches are the Walnut Lane bridge, Fairmount Park, Philadelphia, and the arch over Rocky river, at Cleveland. The Walnut Lane bridge was completed in 1909. It has a clear span of 233 feet and a total width of 60 feet. The live load is 100 pounds per square foot. The total live load carried by the structure is 700 tons and the total load, including the weight of the structure, is 12,000 tons. The Rocky river bridge is now being built. It has a clear span of 280 feet and a total width of 60 feet. It carries a live load of 150 pounds per square foot, a total live load of 1,200 tons and a total load, including weight of structure, of 16,000 tons. It is understood that there are other long spans projected, but definite data concerning them are not available at this writing.

Thus it will be seen that by virtue of the length of span, the total width, the great load to be carried and the necessarily great cost, the Medina aqueduct may properly be considered the most important piece of concrete arch construction ever undertaken. It was therefore deemed both advisable and necessary not only to develop the design with the greatest care along the lines of the most approved theory of arch construction, but to make a series of tests on concrete prisms and model arches, for the purpose of obtaining additional information concerning the behaviour of concrete under certain conditions of stress.

At the meeting of the American Society of Civil Engineers, held September 15, 1909, a paper was presented, entitled "Walnut Lane Bridge, Philadelphia." This paper contained the following statement: "Tests of concrete model arches, made in order to determine questions of design, indicated that it is wise to treat the components of the direct arch stress at the abutment as so much shear acting in a beam. Regarded as such, the vertical component or reaction at the spring of the main arch ribs of this bridge amounts to 108 pounds per square inch of arch section in shear at the face of the skew-back, which would be high for simple concrete, but is allowable for the hybrid* material."

There was no discussion by any member of the society challenging this opinion.

To construct at Medina an arch of sufficient thickness to carry the heavy loads and to keep the shear at the low value indicated by the foregoing quotation is decidedly impracticable. Inasmuch as failure by "shear" — or more properly speaking, by "diagonal tension" — in a reinforced concrete beam has been clearly shown by repeated experiments to commence in the tensile portion of the beam, even where the cracks, once started, extend into the compression side of the beam, and inasmuch as the arch rib should be approximately compared in the nature of its stresses with the compression side of a beam and not at all with the tension side, it is believed that the statement quoted is incorrect and that there is no danger of failure by so-called shear in a properly designed arch. The term shear, as here used, has nothing to do with the phenomena observed in connection with true compression failures under high intensity of stress, and relates only to the possibility of failure along some diagonal plane, before the true compressive

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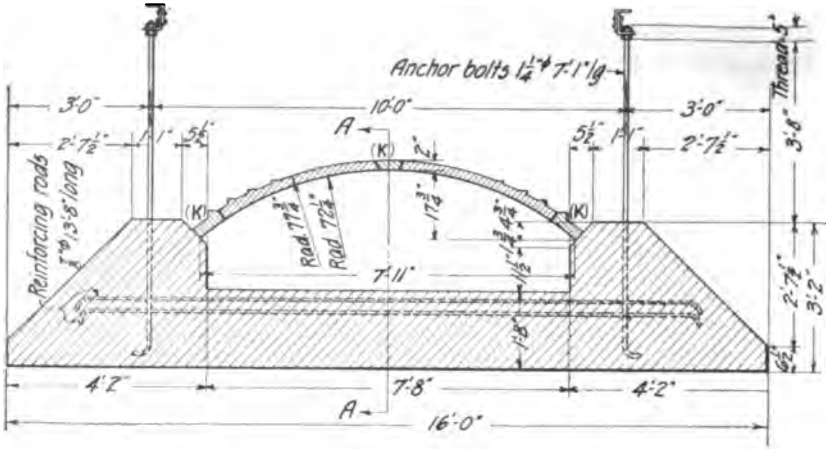
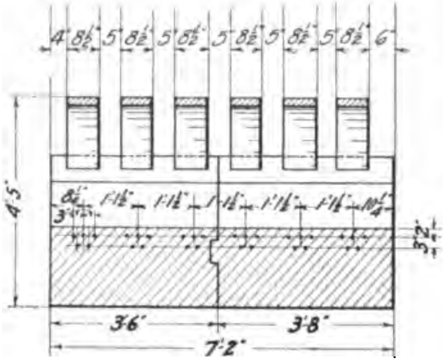
* Hybrid material, as here used, means concrete in which are embedded flat stones, packed close, with bed of stones at right angles to arch thrust.



SECTION THROUGH ARCH RING

Fig. 1



SECTION A-A

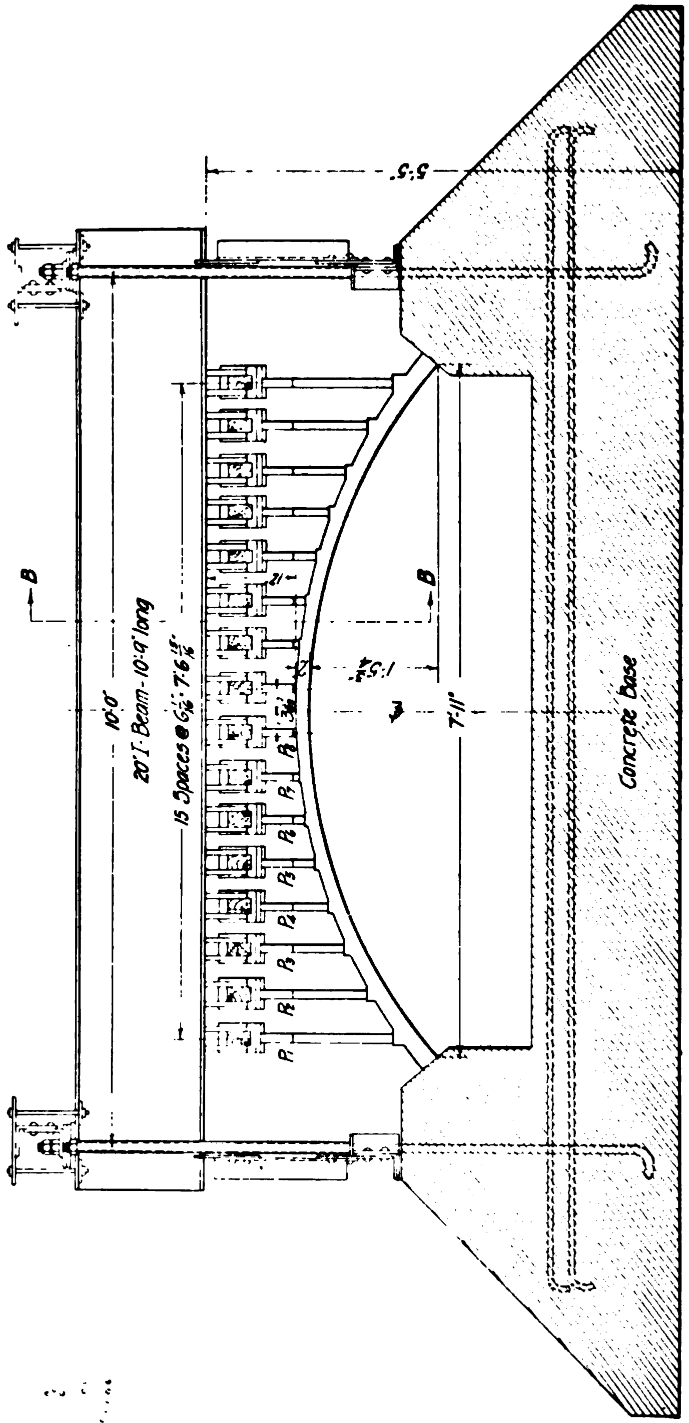
Fig. 2

Notes;-

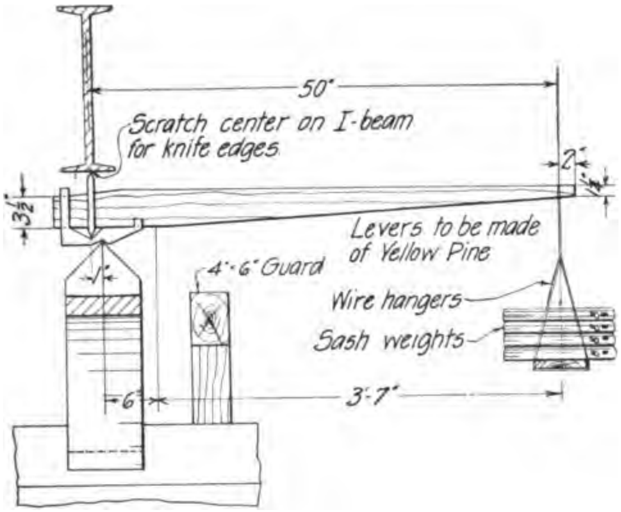
Base made of 1:3:6 concrete.

First series of six arches of 1:2 mortar.

In erecting the arches the keys (K) were not deposited until 48 hours after the body of the arch.

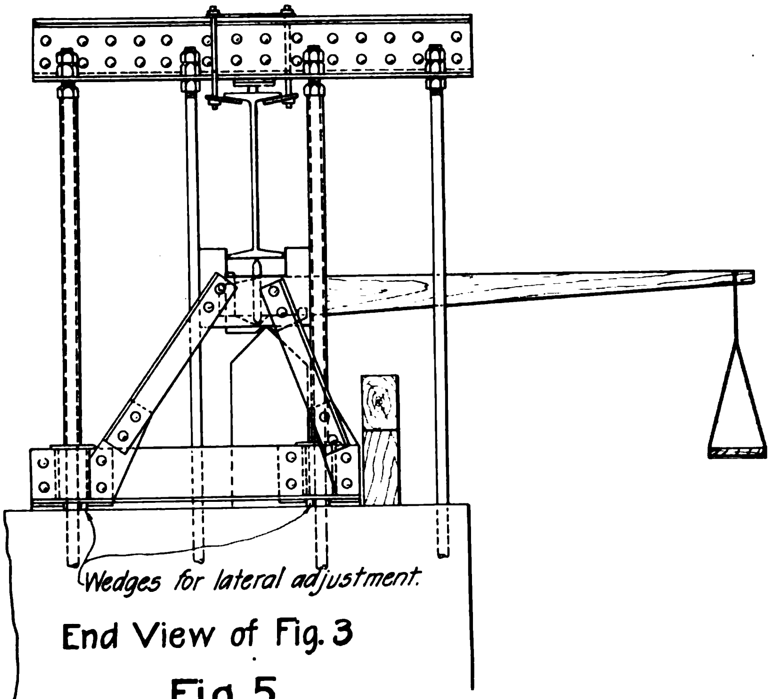


ELEVATION OF ARCH SHOWING LEVERS
For dimensions not shown see Fig. 1
Fig. 3


50"
Scratch center on I-beam for knife edges
2"
¼"
3½"
Levers to be made of Yellow Pine
4"·6" Guard
Wire hangers
Sash weights
6"
3'-7"

Section B-B of Fig. 3

Fig. 4



End View of Fig. 3

Fig. 5

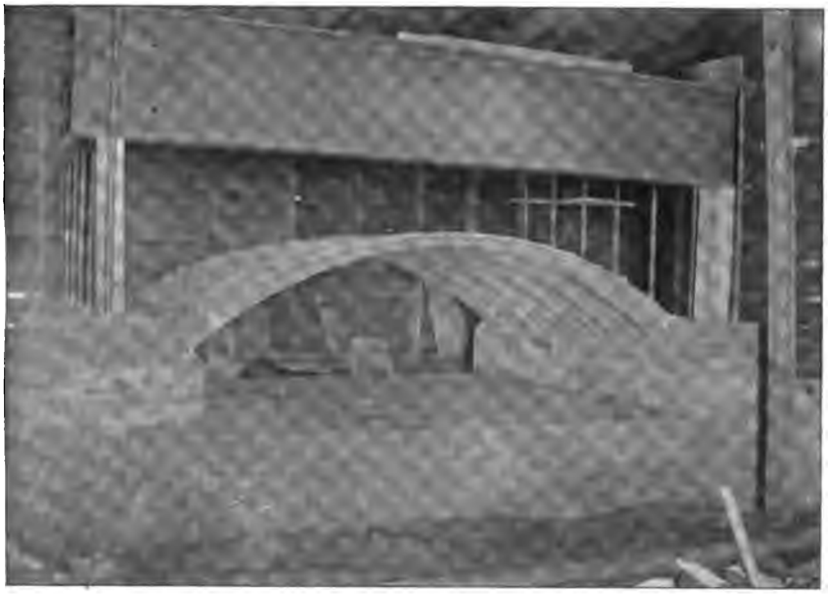
resistance of the concrete is fully developed. The literature of concrete frequently refers to the failure of cubes and prisms by shear, when tested by compression to destruction. Just what is meant in such cases by the word shear is not always clear.

Since no satisfactory evidence could be found of adequate tests ever having been made to prove that the arch would not fail by shear near the spring under shearing stresses of comparatively small intensity, as intimated by the foregoing quotation, it was believed to be still more necessary to obtain further information by tests, both on prisms and on model arches, which should be exact counterparts, except as to size of the ribs of the proposed arch at Medina.

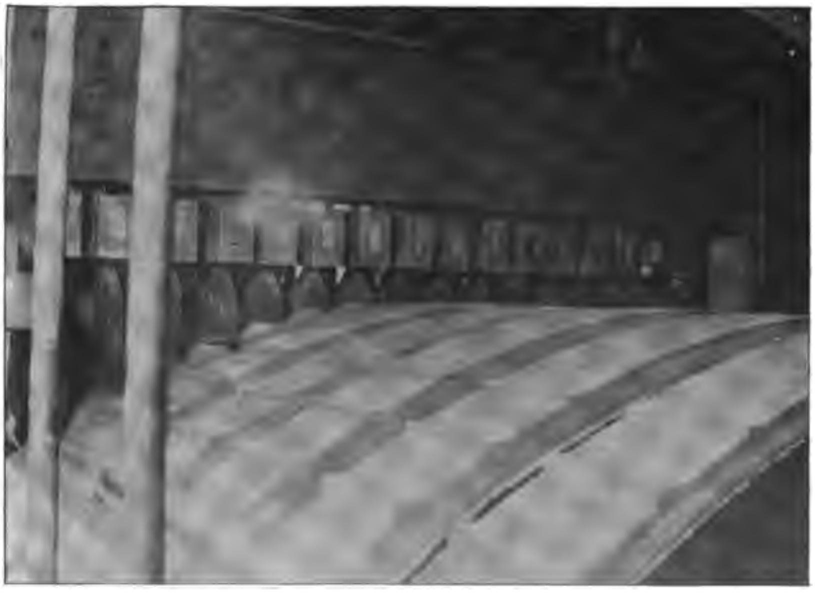
For various reasons it was not believed that the compressive resistance obtained in the test would show the actual unit strength of the full-sized structure. However, it was believed that important information could be secured in regard to the kind of failure and the ultimate strength of arches, as compared with cubes made of the same material, at the same time and by the same experimenter.

It is well known that, on account of the variations of the modulus of elasticity of concrete under varying intensity of stress, the distribution of stress in the compression side of a reinforced concrete beam does not follow the straight line law. It was believed that a similar condition exists under high compressive stress in the case of prisms, columns or arch ribs carrying eccentric loads. In order, therefore, to determine more definitely the allowable working stress in the arch under eccentric stress caused by extreme conditions of temperature and loading, as compared with the allowable average working stress, it was considered advisable to include in the series of concrete prisms some which should be loaded eccentrically.

Six model arches, without reinforcement, have already been made and tested to destruction. Three of these were reduced in section near the springing for the purpose of encouraging failure at that point by vertical shear. These tests, on account of certain difficulties with the testing apparatus and other difficulties encountered in making the models, all of which have since been overcome, were not entirely satisfactory and should not be accepted as conclusive in all respects. They will be followed by another series to be made in the near future, the results of which will be published in a future report. The tests already made, however,



View of arch rings after forms had been removed and before testing had begun.
FIG. 6.



Rear view, showing levers in position for testing.
FIG. 7.

do conclusively show that, whatever the ultimate cause of failure, it does not occur until the model has developed a high unit resistance in compression. It is therefore evident that, if reasonable values are chosen for the intensity of the allowable working compressive stress per square inch, no attention need be paid to the intensity of the shearing stresses at the springing. A complete description of the apparatus for testing the model arches and a discussion of the results will be found in this article under their respective headings.

When the concrete prisms were tested, a few specimens were provided with diagonal grooves, made for the purpose of encouraging failure by diagonal shear. While the tests are not to be considered conclusive in all points until corroborated by an additional series of tests, which also will be made in the near future, yet it is believed that two important conclusions can be drawn at this time, as follows:

(1) Whatever the kind of failure, it does not occur until the prism has developed a high compressive resistance. This conclusion, therefore, amply reinforces the conclusion hereinbefore drawn from the tests on arch models with respect to the danger of failure by shearing near the springing.

(2) The apparent intensity of compressive resistance by the extreme fiber under eccentric loading, when figured upon the assumption of a straight line distribution of stress, is much higher than the average resistance per square inch for prisms loaded centrally, being approximately 33 per cent higher for prisms with one inch eccentricity and over 50 per cent higher with two inches eccentricity. This seems to demonstrate conclusively that the distribution follows substantially the same law as is known to exist for the compression side of reinforced concrete beams. A discussion of the tests on prisms will be found later under its proper heading.

GENERAL DESCRIPTION OF ARCHES AND APPARATUS.

Each dimension of each of the model arches was one-thirty-sixth of the corresponding dimension of the proposed Medina arch. The large arch will carry a total average load of about 2,450 pounds per square foot. This load is considerably greater toward the springing than at the crown, on account of the greater thickness of arch rib and the greater weight of the piers which carry the trough. Under this load an average stress of about 500 pounds per square inch will be produced in the large arch and approximately the same stress will exist in the models under the same load per square foot with the same distribution. The weight of the model rib itself is so small as to be almost negligible. If, then, the concrete in the model has an ultimate average strength of 2,500 pounds per square inch, an average load of approximately 12,250 pounds per square foot will be required for destruction. It is impossible to apply so great a direct load with any certainty that the loads are applied as intended. For this reason a system of sixteen independent levers and knife edges (multiplying the loads by fifty) was arranged, as shown in Fig. 3.

The knife edges were made of hardened steel. The special castings for the levers were designed so as to bring the two knife edge bearings and the applied load in the same plane. In this manner the ratio was kept constant and the loads applied to the arch were kept vertical, with errors so slight as not appreciably to affect the results.

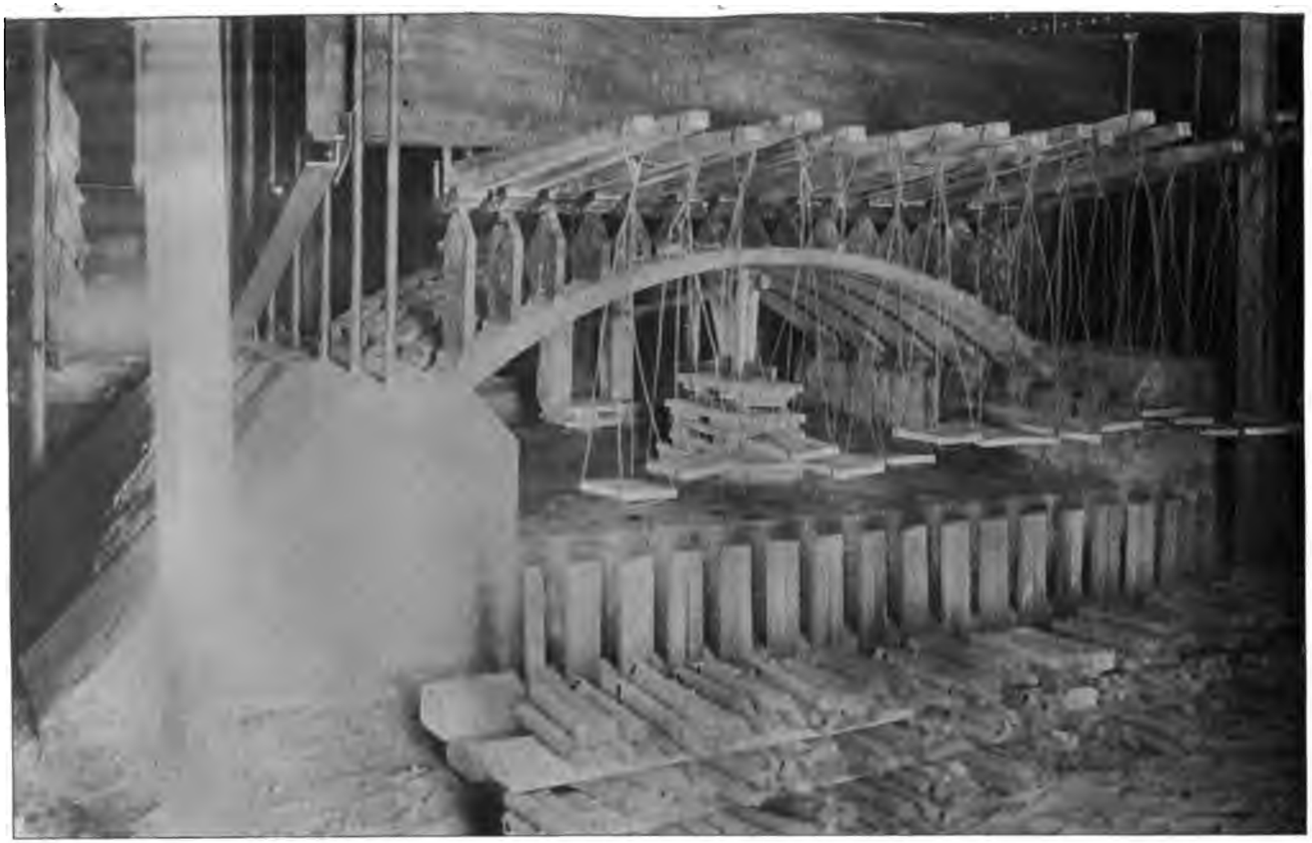
The building in which the tests were made was an old shed which had no floor. It was full of cracks and was unheated. The temperatures during the making and testing ranged from about zero to 40 degrees, Fahrenheit. However, the models were thoroughly protected and were not frozen.

The abutments were made of 1–3–6 concrete and were cast directly on the ground. They were made massive and were heavily reinforced so as practically to reproduce the unyielding abutments of the large arch. However, there was a slight yielding under the extreme loads required for the destruction of a model and small additional stresses similar to those produced by the rib shortening were thus introduced.

The general dimensions of the model arches and abutments are shown in Fig. 1. In the first series six arches were cast, made of mortar composed of one part American Portland cement and two parts of Albany sand. In order partially to eliminate stresses due to shrinkage, three sections, or keys, were provided, one at the crown and one at each springing, which were filled two days after the body of the arch was cast.

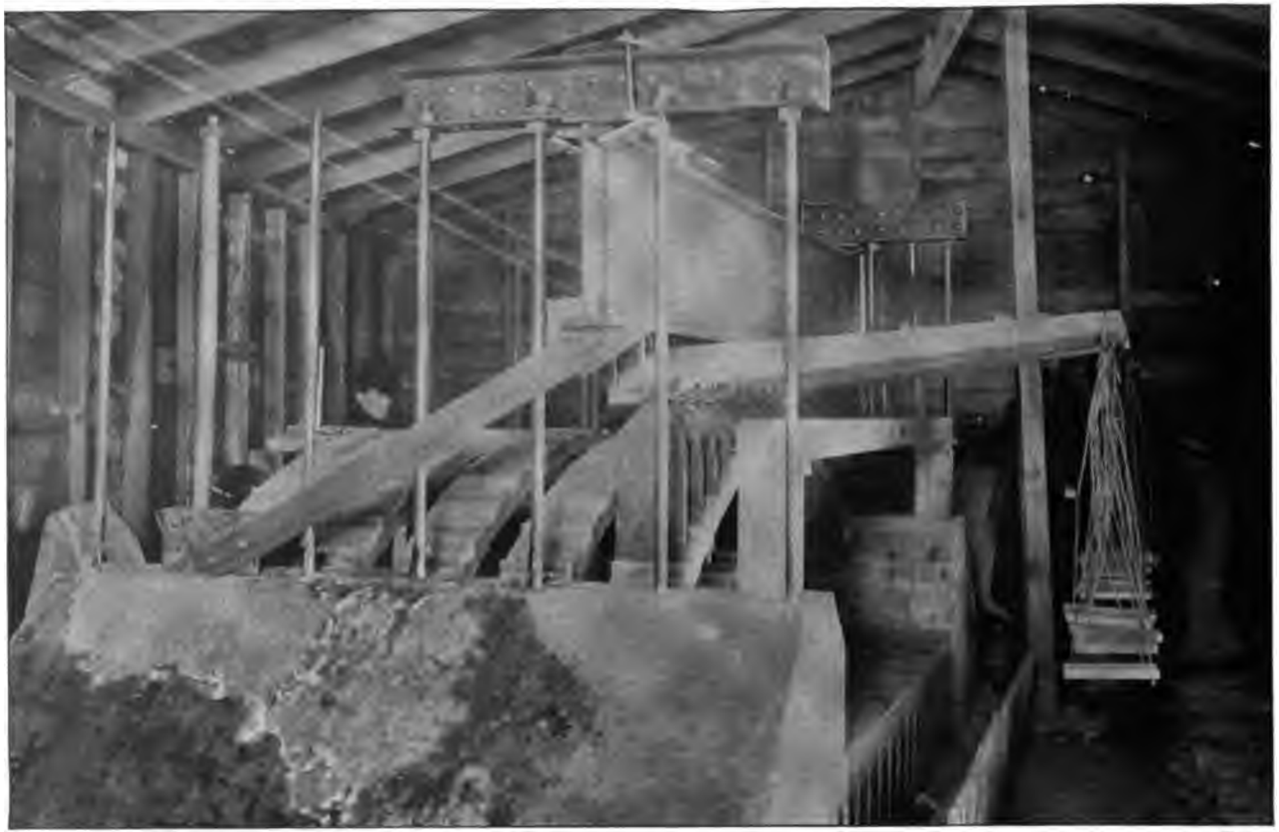
During the test it was found that some of the keys had not been quite thoroughly filled. This was particularly true of the keys at the springing. The imperfect contact at this point undoubtedly led to lower results than would otherwise have been secured.

The six arches were cast in one continuous operation. Each arch was constructed in two layers, the first layer of all the arches



Front view—just before beginning a test. Sash weights, arranged in suitable piles, are seen in the foreground.

Fig. 8.



End view—just before beginning a test.

Fig. 9.

being deposited before the second layer of any was begun. The length of time required for this work was considerably greater than had been anticipated and some of the material had taken an initial set before the work was finished. While it is probable that this did not greatly weaken the material, yet the tests apparently showed the effect of the initial set at the time of failure by the splitting of the ribs in several cases along the line of separation between layers.

As might have been expected with a new piece of testing apparatus, certain modifications were found necessary in order to secure the best results. For example, the braces used to hold the lower flange of the I-beam (shown in Fig. 9) have been replaced by the braces shown in Fig. 5; the latter permit of more rapid and satisfactory adjustment, both horizontally and vertically. Such modifications as were necessary have been made and the difficulties met with during the first series have been so overcome that the projected series will doubtless be of more value than the first.

When the first arch was tested, the loads were applied by means of sand poured gradually according to a carefully prepared program into bags suspended from the ends of the levers. This plan was generally successful, but on account of difficulties in handling the sand and objectionable dust, cast iron sash weights of various sizes were used for the other tests. These weights were carefully applied, also according to program, by hand, one at a time, so as to avoid shock and keep the line of pressure very nearly in the desired position. The desired ratio of loads was computed after several trials and was so chosen as to keep the line of pressure as close as possible to the axis of the arch at all points. The ratio was approximately maintained throughout the entire application of the loads, the per cent of variation from the ratio constantly decreasing during application.

However, additional bending stresses were momentarily produced and the ultimate breaking loads, therefore, were probably slightly less than would have been found, had a more ideal method of loading been followed. All of the arches had open joints at the keys, caused by shrinkage and fall in temperature. These joints closed under moderate loads.

Arches Nos. 4, 5 and 6 were reduced 38 per cent in section near the springing, in order, if possible, to encourage failure by shear on a vertical plane. The loading for these was identical with that for the others and the eccentricity of the reduced section has been considered in computing the stress on the extreme fiber.

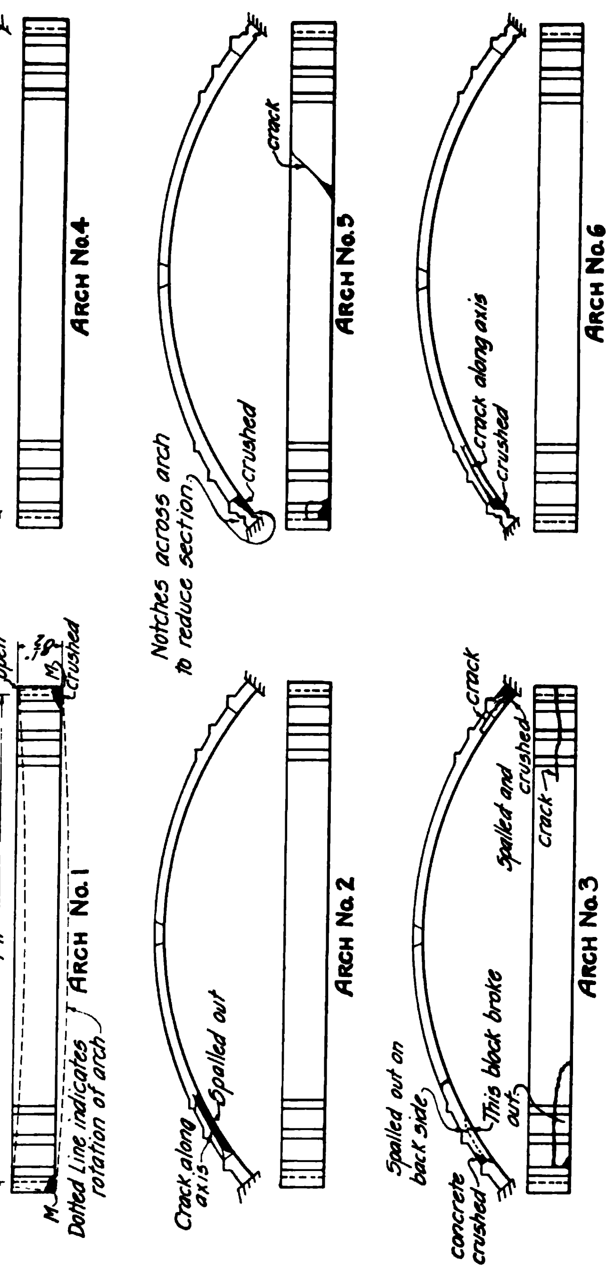
All stresses given in the table are computed for actual loads at time of failure. The formulas used may be found in Church's *Mechanics,* Johnson's *Framed Structures,* and Turneaure and Maurer's *Principles of Reinforced Concrete Construction.* As is customary, the variation of modulus of elasticity of concrete under varying intensity of stress, has been ignored and a straight line distribution assumed. The effect of rib shortening has been included. The effects of shrinkage and temperature are comparatively small and have not been included. Allowance was not made for the reduction of restraint due to the reduction at the springing of models Nos. 4, 5 and 6. The tabular stresses are therefore believed to be somewhat too high.

DETAILED DESCRIPTION OF ARCH TESTS.

Arch No. 1 was heavily loaded three times. Sufficient allowance was not made for the deflection of the levers and the 20-inch I-beam was not properly braced horizontally. The multiplying ratio of the levers was therefore maintained only through a portion of the test. The vertical knife edges were thrown out sufficiently to produce a severe horizontal thrust on both I-beam and arch. The arch finally rotated about an axis (M-M, Fig. 10), crushing the concrete at these points to such an extent that the model was useless for further tests. It is impossible to determine even approximately the maximum unit resistence developed.

Arch No. 2 first showed signs of failure by splitting along the axis near the key at the springing. On account of difficulties of adjusting the apparatus, not entirely overcome when this arch was tested, the piers were not properly centered on the arch. The eccentricity of loading thus caused, increased the stresses at the extreme fiber by about 20 per cent at the crown and 35 per cent at the springing. Allowance has been made for this eccentricity in computing the tabular stresses. As previously explained, the concrete was deposited in layers and the splitting was encouraged by this fact.

Arch No. 3 failed and collapsed suddenly by crushing at the joint between rib and key at the springing. This arch was accidentally overturned and broken when an adjacent arch failed. It was put together and tested. The contact at the joints was necessarily imperfect and this somewhat accounts for the lower ultimate resistance of this arch as compared with the others.



DIAGRAMS SHOWING KIND OF FAILURE.
Fig. 10

Arch No. 4, one of the three reduced in section, failed by crushing at the joints between rib and keys at the springing and collapsed suddenly. Before the test began it was seen that the area of contact at these joints was very much reduced by imperfect workmanship. The tabular stress was based on the eccentricity of the reduced sections.

Arch No. 5 was one of those reduced in section. It failed by crushing between the reduced section and the adjacent joint and collapsed suddenly. After failure began, the rib twisted forward and cracked, as shown in plan (Fig. 10).

Arch No. 6 was also one of those reduced in section. The first sign of failure was a crack along the axis just above the key at the springing. This crack grew wider rapidly; it was quickly followed by crushing at the reduced section and a complete collapse.

Six 6-inch cubes were cast of arch material at the time the ribs were cast. They showed an average ultimate strength in compression, at 28 days, of 2,080 pounds per square inch. These tests were not entirely satisfactory and are not to be accepted as conclusive.

TESTS OF MODEL ARCHES.

Arches, 7 ft. 11 in. clear span, 2 in. thick at crown. All models composed of 1 part Portland cement and 2 parts Albany sand.

Arch number.	Date made.	Date of test.	Age, days.	ITEMS.	LOADS, IN POUNDS.								Total load on arch in pounds.	Load on arch in pounds per sq. ft.	MAXIMUM STRESSES, IN POUNDS PER SQUARE INCH.			
															AT POINT P_7.		AT SPRINGING.	
					P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8			Top.	Bottom.	Top.	Bottom.
				Loads exerted on arch by weight of arch, plates, levers, etc.	256	240	225	217	211	207	204	203	....	....	238	34	159	85
1	Dec. 3, '09	Jan. 5,'10	33	Weight on levers at failure (approx.)... Total load on arch........	150	150	145	140	150	135	150	145	....	....	....	....	....	....
2	Dec. 3,'09	Jan. 8,'10	36	Weight on levers at failure........ Total load on arch........	97½ 5,131	103 5,390	88½ 4,650	82½ 4,342	82½ 4,336	73½ 3,882	73½ 3,879	64½ 3,428	70,076	12,500	4,378	1,804	2,710	3,664
3	Dec. 3,'09	Jan. 14,'10	42	Weight on levers at failure........ Total load on arch........	87 4,606	90 4,740	82 4,325	80 4,217	80 4,211	69 3,657	69 3,654	57 3,053	64,29	11,600	3,370	1,454	1,953	2,451
4	Dec. 3,'09	Jan. 11,'10	39	Weight on levers at failure........ Total load on arch........	79 4,206	85 4,490	75 3,975	70 3,717	70 3,711	63 3,357	63 3,354	52 2,803	59,226	10,580	3,111	1,264	752	4,104
5	Dec. 3,'09	Jan. 18,'10	46	Weight on levers at failure........ Total load on arch........	79 4,206	85 4,490	75 3,975	70 3,717	63 3,361	57 3,057	57 3,054	47 2,553	53,826	10,140	2,722	1,350	*19	4,595
6	Dec. 3,'09	Jan. 21,'10	49	Weight on levers at failure........ Total load on arch........	71 3,806	77 4,090	67 3,575	63 3,367	63 3,361	57 3,057	57 3,054	47 2,553	53,726	9,600	2,839	1,139	729	3,687

Tension stress.

DESCRIPTION OF PRISM AND CUBE TESTS.

The results of tests on prisms and cubes are shown in the accompanying table. This is supplemented by a diagram (Fig. 12), a view of the testing apparatus (Fig. 11) and a photograph of some of the specimens after failure (Fig. 13).

In computing the tabular stresses it has been assumed that a straight line distribution of stress obtains and, except where the maximum unit tension is small, that the concrete takes no tension whatever. That the former assumption is incorrect, due to the variation of the modulus of elasticity with variation of stress intensity, is clearly indicated by the fact that the maximum calculated resistance of plain-sided prisms with one inch eccentricity is 34 per cent greater and with two inches eccentricity is 50 per cent greater than with similar prisms centrally loaded. The average calculated resistance for six prisms, both with and without grooves all having 1½ inches eccentricity is 44 per cent greater than the plain-sided prisms centrally loaded.

The theory of distribution of stress in the grooved prisms is complex and the tabular stresses are approximate only, having been computed from the moment of resistance of a plane at right angles to the axis at the point where failure occurred.

Test specimen No. 2 failed at a low load by splitting, on account of the use of too thin a cap plate (Fig. 13). Hardened steel plates two inches thick were used on all other prisms.

Much care was taken to secure the greatest possible uniformity in the character of the test specimens. It will doubtless be of interest to notice the great uniformity of the tests, as shown by prisms Nos. 10, 22; 11, 23 and 12, 24.

The value of these tests does not lie in the absolute values obtained in resistance to compression, but in the general conclusions indicated, namely, (1) that, if a straight line distribution be assumed, the working unit stress on the extreme fiber, when the line of pressure passes at the edge of the middle third, may be considered as at least 30 per cent higher than the allowable working stress, when the line of pressure lies on the neutral axis; this will undoubtedly be as true for arches as for prisms; (2) that, if reasonable values be chosen for unit stresses in compression, no account need be taken of so-called shear for an arch rib or column sustaining a thrust parallel or nearly parallel to the axis.

Final values of working unit stresses will not be chosen, until the second series of tests on both arches and prisms are completed.

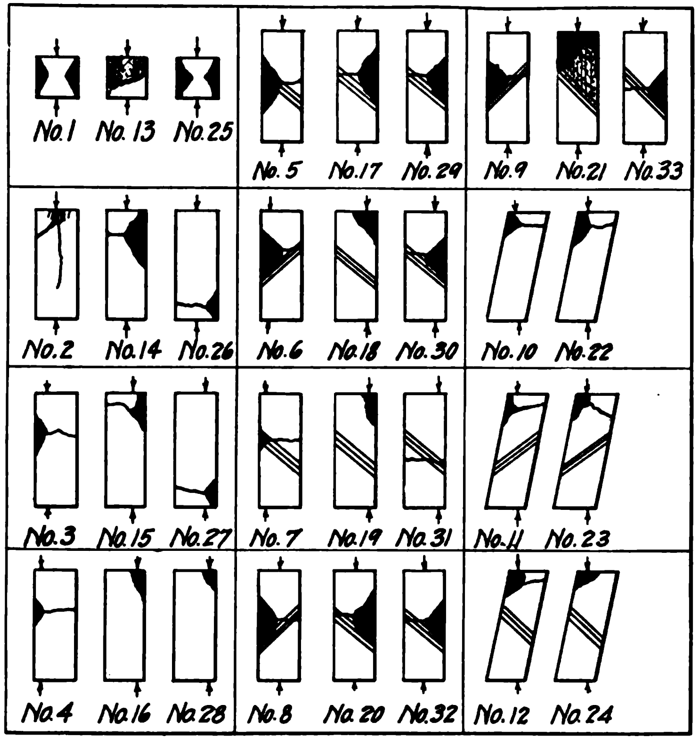
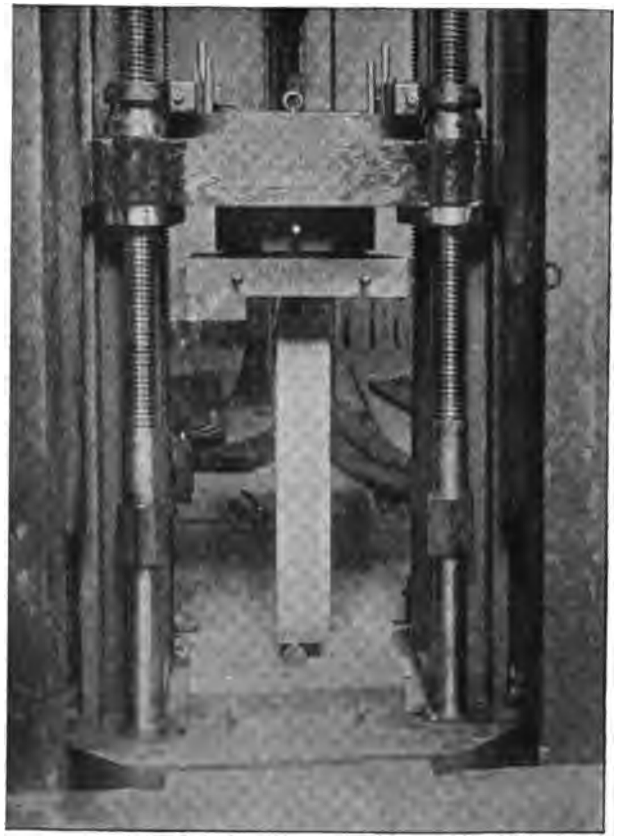
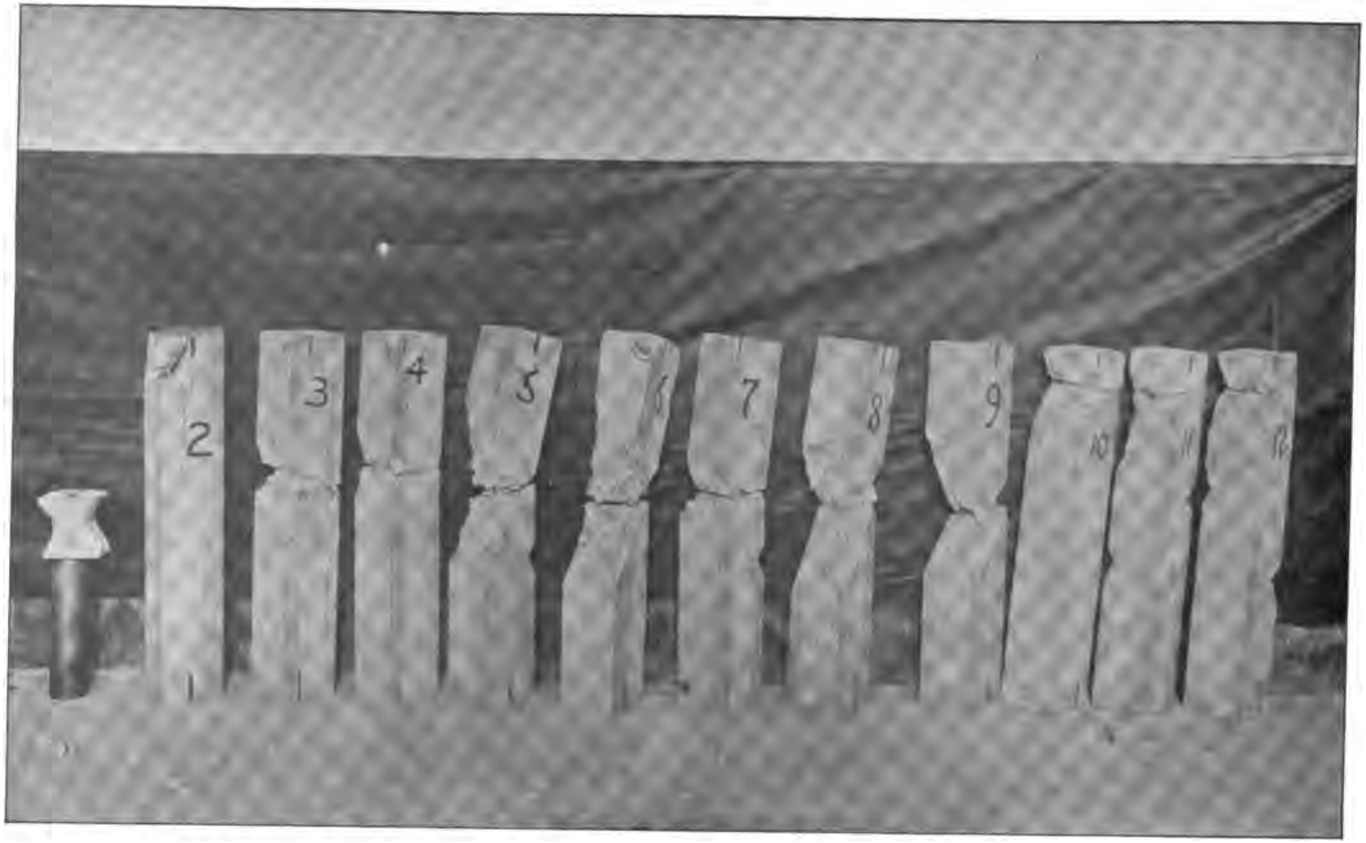


DIAGRAM SHOWING FAILURE OF PRISMS.
Fig. No.12.



Apparatus for testing cubes and prisms.
FIG. 11.



First batch of prisms after testing.

FIG. 13.

TESTS OF PLAIN CONCRETE PRISMS AND CUBES.

Prisms, 6 x 6 x 36 inches. Cubes, 6 x 6 x 6 inches. Composition: 1 part American Portland cement, 2 parts Albany bank sand, 4 parts ¾-in. limestone. Tested at Rensselaer Polytechnic Institute, Troy, N. Y., November 11, 15 and 19, 1909. Age of all specimens was twenty-one days.

Specimen Number.			Size.	Description.	How loaded.	Load at incipient failure.	Load at ultimate failure.	Stress per sq. in. at incipient failure.	Stress per sq. in. at ultimate failure.	Average stress at ultimate failure.
1st batch.	2d batch.	3d batch.								
						Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	...	...	6" x 6" x 6"	Plain sides.............	Centrally.......	82,300	82,300	2,280	2,280	2,520
...	13	...	Do.	......do..............	.....do.........	73,500	100,200	2,040	2,780	
...	...	25	Do.	......do..............	.....do.........	90,230	90,230	2,500	2,500	
2	...	...	6" x 6" x 36"	Square ends, plain sides.	.....do.........	39,500	39,500	1,100	1,100	....
...	14	...	Do.		.....do.........	76,170	76,170	2,110	2,110	2,075
...	...	26	Do.		.....do.........	73,570	73,570	2,040	2,040	
3	...	...	Do.	......do..............	Eccentrically 1".	51,190	51,190	2,840	2,840	2,780
...	15	...	Do.	......do..............	.....do.........	49,280	49,280	2,740	2,740	
...	...	27	Do.	......do..............	.....do.........	49,640	49,640	2,760	2,760	
4	...	...	Do.	......do..............	Eccentrically 2".	25,600	29,970	2,840	3,303	3,107
...	16	...	Do.	......do..............	.....do.........	25,810	25,810	2,870	2,870	
...	...	28	Do.	......do..............	.....do.........	28,040	28,040	3,120	3,120	
5	...	...	Do.	Square ends, sides grooved 1" deep, 39° with vertical.	Centrally.......	52,270	52,270	1,784	1,784	2,259
...	17	...	Do.		.....do.........	74,800	74,800	2,532	2,532	
...	...	29	Do.		.....do.........	72,910	72,910	2,461	2,461	
6	...	...	Do.	......do..............	Eccentrically 1".	50,100	50,100	3,150	3,150	2,913
...	18	...	Do.	......do..............	.....do.........	44,600	44,600	2,480	2,480	
...	...	30	Do.	......do..............	.....do.........	49,450	49,450	3,110	3,110	
7	...	...	Do.	......do..............	Eccentrically 2".	24,100	24,100	3,160	3,160	2,706
...	19	...	Do.	......do..............	.....do.........	18,000	21,950	2,000	2,439	
...	...	31	Do.	......do..............	.....do.........	19,200	19,200	2,520	2,520	
8	...	...	Do.	Square ends, sides grooved 1" deep, 33° with vertical.	Centrally.......	59,180	59,180	1,983	1,983	2,248
...	20	...	Do.		.....do.........	74,900	75,900	2,480	2,540	
...	...	32	Do.		.....do.........	66,290	66,290	2,220	2,220	
9	...	...	Do.	Square ends, sides grooved 1" deep, 45° with vertical.	.....do.........	54,590	54,590	1,865	1,865	2,322
...	21	...	Do.		.....do.........	72,350	72,350	2,460	2,460	
...	...	33	Do.		.....do.........	77,400	77,400	2,640	2,640	
10	...	...	Do.	Beveled ends, plain sides.	Eccentrically 1½"	40,120	40,120	2,970	2,970	2,960
...	22	...	Do.		.....do.........	39,890	39,890	2,950	2,950	
...	...	...	....		....	....	....	....	....	.....
11	...	...	Do.	Beveled ends, sides grooved 1" deep, 39° with vertical.	.....do.........	40,220	40,220	2,980	2,980	3,015
...	23	...	Do.		.....do.........	41,180	41,180	3,050	3,050	
...	...	...	....		....	....	....	....	....	.....
12	...	...	Do.	Beveled ends, sides grooved 1" deep, 33° with vertical.	.....do.........	40,600	40,600	3,010	3,010	3,040
...	24	...	Do.		.....do.........	39,000	41,450	2,890	3,070	
...	...	...	....		....	....	....	....	....	.....

REPORT

OF

RESURVEYING AND REMONUMENTING

THE

NEW YORK-CONNECTICUT BOUNDARY LINE

Report of Resurveying and Remonumenting the New York-Connecticut Boundary Line.

ALBANY, N. Y., *October* 1, 1909.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor, Albany, N. Y.:*

Dear Sir.— I herewith submit the preliminary report on resurveying and remonumenting of the boundary line between the states of New York and Connecticut. This report covers the work done on this line during the past fiscal year.

The first effort to adjust the boundary line between New York and Connecticut was made September 19, 1650, when articles of agreement were concluded between Commissioners of the United English Colonies and the Delegates of Peter Stuyvesant, Governor General of New Netherlands. On April 23, 1662, the Colony of Connecticut received its charter from Charles II, and the boundary with New York read: " In longitude as the line of the Massachusetts Colony running from east to west, that is to say, from the said Naragansett Bay on the east, to the South Sea on the west part, with the islands thereunto adjoining." In the grant to the Duke of York, dated March 12, 1663, the boundary with Connecticut read: "All the lands from the western part of Connecticut river to the eastern part of Delaware Bay." It will be seen therefore, that all the land from the west side of Connecticut river to the South Sea (or Delaware Bay) could be claimed by both New York and Connecticut. As a matter of fact, both did claim this disputed territory and even though many commissioners were appointed and numerous conferences were held, all efforts proved of no avail until finally, in 1860, New York appointed commissioners who, independently of Connecticut, surveyed and monumented the line. Connecticut still refused to recognize this line as the boundary and not until 1880, upon the report of a joint commission, was the dispute finally settled.

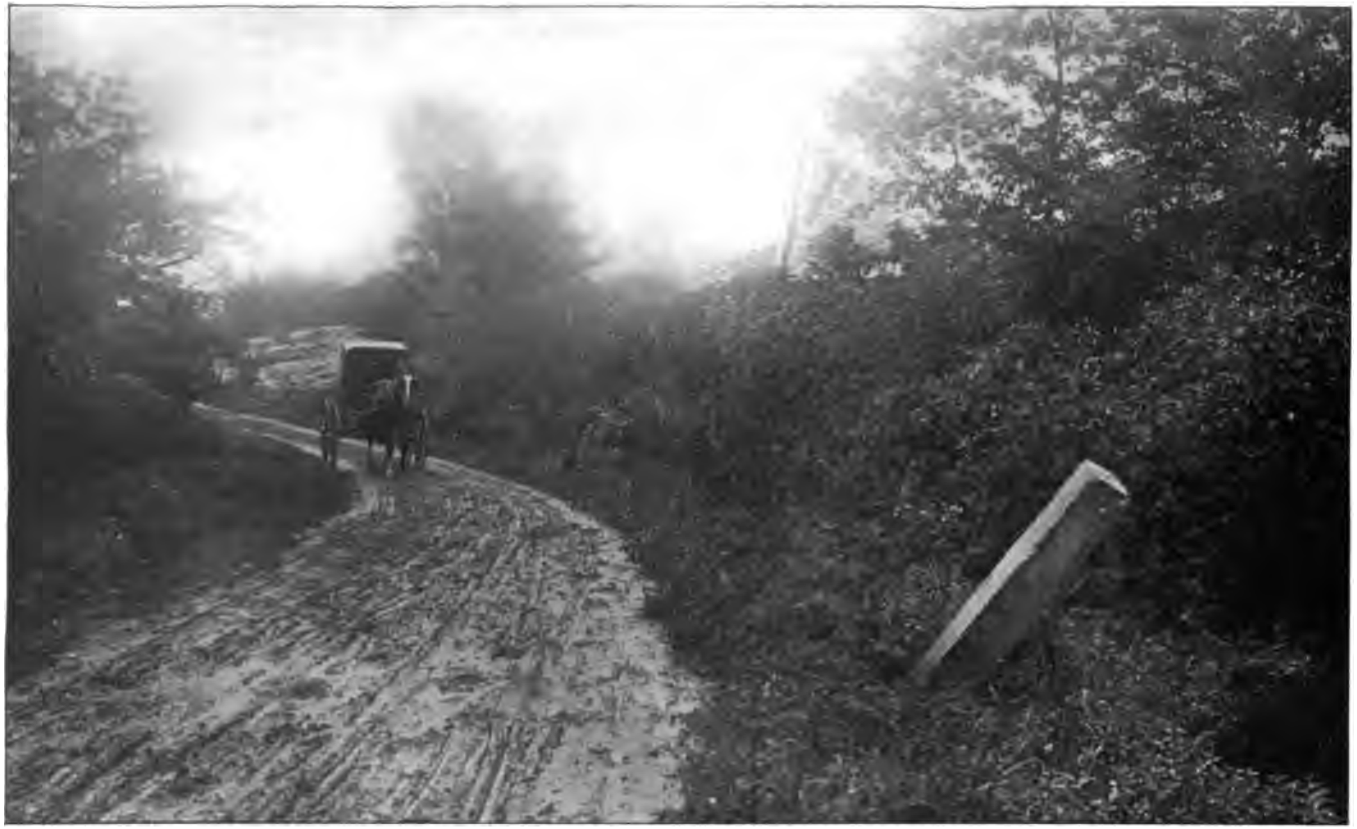
The monuments erected by the commissioners in 1861 were more or less temporary in character, some being roughly hewn granite or marble slabs, while others were nothing more than iron pins, one inch square and projecting about six inches out of the rock. A boundary line thus inadequately marked is a disgrace to both states. Many disputes have arisen and these could be settled only by running out a portion of the line. In making the triennial examination of the line, as directed by law, many of the monuments have never been found by representatives of the Department.

For many years this State has recognized the necessity of remarking the line and the several State Engineers have endeavored to secure the coöperation of Connecticut for this purpose. Not until the summer of 1908 did the State of Connecticut signify a desire to take up the matter and press it to completion. While there was no special appropriation for the purpose, the State Engineer and Surveyor of this State decided to take advantage of this proposition on the part of Connecticut and to use what remained of the annual appropriation for "Examination, Monuments and Maps" to start the work. Accordingly a representative of Connecticut met the State Engineer and Surveyor of New York and an agreement was drawn up and signed as follows:

"*Whereas,* By virtue of the provisions of Chapter 421 of the Laws of 1887, of the State of New York, the State Engineer and Surveyor of the State of New York, is authorized and required to cause to be made an examination and inspection of the monuments marking the boundary lines of that state and to coöperate with the proper authorities of the adjoining states in the examination and inspection and the restoring and replacing of such monuments, and is clothed with full authority to represent the State of New York in discharging such duties, and

"*Whereas,* By virtue of the provisions of an act of the Legislature of the State of Connecticut, approved on the 23d day of March, 1902, the Governor of the State of Connecticut is empowered to appoint an agent authorized to act with duly appointed agents for the adjoining states to restore and repair any such monuments or boundary marks as are injured or removed, and

"*Whereas,* It appears from the examinations made triennially by the State Engineer, as by law required, that many of the



NEW YORK–CONNECTICUT BOUNDARY LINE.
View showing the condition of one of the old monuments.

monuments marking the New York–Connecticut boundary line have been removed — most are in bad repair and nearly all are too small to be permanent — and that many new highways and other prominent points are wholly unmarked, and

"*Whereas,* Frederick Skene, State Engineer of New York, has delegated Resident Engineer H. P. Willis of Albany as his representative, and his Excellency the Governor, Rollin S. Woodruff, has appointed Henry Robinson Buck, of Hartford, Chief Engineer of the Massachusetts-Connecticut State Boundary Line Commission, as Commissioner for the State of Connecticut,

"*Now, Therefore,* It is agreed by and between the undersigned, acting in conformity with the authority conferred as hereinbefore stated, that the said Henry Robinson Buck and H. P. Willis, representing the States of Connecticut and New York, respectively, shall, and by these presents are hereby empowered, to supervise the repairing, resetting and replacing of all such boundary line monuments at prominent points where same are required; and,

"It is understood and agreed that the said agents will endeavor to remark and more permanently locate the line surveyed and marked by the Commissioners of the State of New York in 1860 and accepted by the State of Connecticut in 1880, making no changes in the line as then established.

"It is further agreed that the manner of repairing and resetting old monuments and the character, style and the method of obtaining such new monuments as may be placed and the manner of setting same shall be agreed upon by the agents herein designated whenever necessary, agreeing that the stones at present standing upon the line shall be used whenever practicable and that in general, stones shall be set in concrete in order that such monuments as are set shall be as permanent as possible.

"It is further agreed that the said representatives herein referred to and appointed under the authority above mentioned, shall proceed at once to the discharge of the duties herein set forth and shall diligently prosecute the same to the end that the work may be completed at as early a date as possible.

"It is further agreed that the States of Connecticut and New York shall each furnish one-half of the necessary outfit for the prosecuting of this work, the details to be arranged between the said representatives.

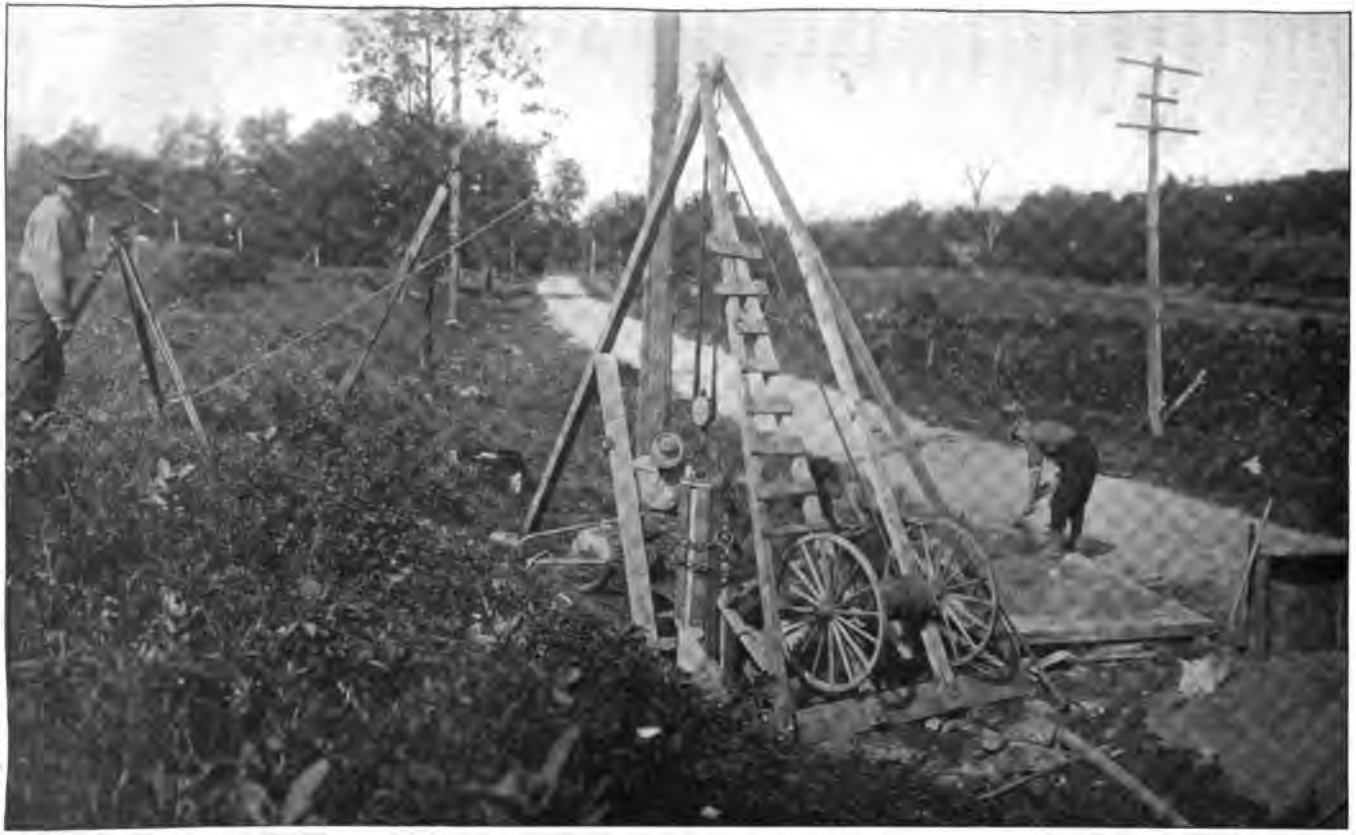
"It is further agreed that all expenses for labor and materials and other necessary expenses incurred, shall be shared equally between the States of New York and Connecticut, except that the salary and personal expenses of the representatives herein named shall be paid by their respective states. It is agreed, however, that neither agent shall have power to make any contract or agreement obligating the State he represents to the payment of any money unless and until the funds for such payments have been made available according to the statute for such cases provided.

"It is further agreed that when said agents shall have completed the work provided for in this agreement they shall prepare a map and report which shall give in detail the location and condition of each monument with a statement of such action as may have been taken in regard to the same; said report and map to be made in duplicate and signed by both representatives, one copy to be filed in the office of the State Engineer and Surveyor at Albany, New York, and one in the office of the Secretary of State at Hartford, Connecticut.

"*In witness whereof*, Frederick Skene, State Engineer and Surveyor of the State of New York, and Rollin S. Woodruff, Governor of the State of Connecticut, have hereunto set their hands and seals this 26th day of September, 1908."

It developed that it would prove of advantage to both states if each should provide for one-half the required number of monuments. Tenders were mailed by the State Engineer and Surveyor and bids invited from various dealers in granite monuments. The bid of the Ausable Forks Granite Company was accepted and a contract drawn, providing for the delivery of fifty monuments, according to the following specifications:

"The monuments are to be of good quality, light colored granite, free from seams or other defects, straight and of full size throughout, not less than 9 nor more than 10 feet in length, 12 inches square, 4 feet down from the top, tapering from 12 inches square to not over 15 inches square in the next 1½ feet and not less than 12 inches nor more than 20 inches on any face the rest of the



New York–Connecticut Boundary Line.
Method of setting a new monument.

distance. The top and the four sides of each monument for a distance of 4 feet from the top are to be cut smooth at right angles with each other and finished with six-cut work. The tapering portion to be pointed to a smooth even surface to conform to the dimensions given. The remaining portions to be left as split, but full size, not less than 12 inches square throughout, the bottom to be not less than 12 inches square and substantially at right angles to the sides, and every point of the lower five feet of the stone must lie outside the planes of the smooth cut portion. On one side will be cut the letters 'N. Y.'; on the opposite side will be cut the letters 'CONN.' On the third side will be cut the figures '1909.' The above described lettering to be included in the price bid for item 1. When directed by the Engineers, additional similar letters shall be cut as may be ordered. A schedule of the lettering will be furnished the contractor as the work proceeds, indicating the required marking of the monuments. The letters 'N. Y.' and 'CONN.' on each bound are to be 5 inches high; the figures to be 4 inches high. All letters to be cut with V-shaped indentations at least ½ inch deep. A ½-inch hole at least 1 inch deep to be drilled in the center of the top.

"All work is to be done in the best manner by skilled workmen and the dressed portions of the monuments are to be securely boxed before shipping. The dimensions of the monuments, the portions which are to be dressed and the location, character and size of lettering to be placed thereon are shown on a plan marked 'Plan of Proposed Monuments for Marking the Boundary Line between New York and Connecticut.' This plan is referred to and made a part of these specifications and is to be followed in all details not mentioned herein.

"The monuments furnished shall conform strictly to the specifications both as to material and workmanship to the satisfaction of the Engineers, and their approval of the same shall be made a condition precedent to the right of the contractor to receive any money therefor.

"The monuments when finished are to be delivered f.o.b. cars, directed to such stations as the Engineers shall from time to time designate.

"The exact number of monuments required is not as yet definitely settled, but it is estimated to be 100, and the Engineers reserve the right to increase or decrease this number by not exceeding 15 per cent at any time before the last of these monuments are shipped.

"The monuments are to be delivered not less than 25 before December 1, 1908, and the remainder after April 1, 1909, as ordered by the Engineers, at such places as may from time to time be directed.

"Payment will be made monthly of 75 per cent of the value of the monuments cut and accepted at the quarry, and 90 per cent of the value of those received and accepted at the delivery points, but no payments, except final one, will be made until at least 25 bounds have been received and accepted since the last previous payment. The remaining 10 per cent will be retained until the completion of the work and will be paid within sixty days after the receipt of the last bounds delivered.

"If required by the Engineers, samples not less than six inches square and 2 inches thick of the granite to be used by any bidder must be furnished before the contract is awarded, the sample to have one side dressed as required by the specifications."

These monuments were all delivered on the ground during the past summer. The following report of work from October 8, 1908, to January, 1909, is submitted by Mr. H. P. Willis, who had charge of the work for the State of New York during this period.

"About the first of October, 1908, the representative of the State of New York met Mr. Henry Robinson Buck, the representative for Connecticut, and proceeded to organize parties for the execution of the work specified in the agreement. A triangulation party was first made up and placed in charge of Mr. E. E. Pierce, a man of wide experience in this class of work. Most of the activity for the remainder of the season was devoted to triangulation and by early December, when the weather became such as to make it impracticable to proceed farther, the triangulation work had been prosecuted to a point fourteen miles northerly from the Ridgefield angle, or approximately one-half the entire length of the line. The detailed report and the map showing

NEW YORK–CONNECTICUT BOUNDARY LINE.
One of the new monuments in place.

the whole triangulation scheme will be presented with the final report to be made after all of the work is completed.

"Soon afterwards the traverse party was organized and placed in charge of the representatives for the State of New York. The work was started from the 'Great Stone' at the 'Wading Place' in the Byram river and was run to a point four miles beyond the angle at Dukes Trees. Owing to the fact that this portion of the line runs through or nearly parallel to King street and consequently through many valuable estates, the progress was necessarily very slow.

"As soon as the traverse party had run the line to the point named, it was sent to the beginning of the line, where the work of taking topography was begun. On account of the location of this portion of the line considerable labor was entailed in this work, and in December, when the weather became so bad that it was impracticable to work later, the party was nearly to the angle at Dukes Trees, where the work was discontinued for the year."

Work in 1909. Chapter 433 of the laws of 1909 carried an appropriation of six thousand dollars for further work on this line. As soon as this appropriation was available, on June 1, 1909, the writer, in company with Mr. H. P. Willis and Mr. P. W. O'Grady (who took Mr. Willis' place in the field this year) met Mr. Henry Robinson Buck, representing Connecticut, at Port Chester and arranged for the season's work. An examination was made of the line along the Byram river between Long Island sound and the "Great Stone" and the markers on this line were found to be in very bad condition, a number of them being missing altogether. As there were a number of difficulties tending to make this work more expensive than that to the north, it was decided to leave the remarking of this part of the line until later and to push the work from Dukes Trees north. A survey party was organized, which began work on June 7, 1909, in charge of Mr. P. W. O'Grady, Assistant Engineer. It was soon found advantageous to put a chopping party at work clearing the line for the traverse party, as considerable wooded land was encountered north of the angle at Dukes Trees.

By October 1, 1909, the line had been run and topography taken as far north as Old Bound No. 43, about 33 miles of the line having been completed from June up to this date.

The monuments purchased of the Ausable Forks Granite Company were inspected and accepted on July 20, 1909, and were at once shipped in two carload lots to Ridgefield, Ct., and Valhalla, N. Y., and delivered from these places to the points where they were to be set. A party was put at work setting these monuments on September 6, 1909, stone No. 89 being the first monument set. Stones Nos. 88, 90 and 91 were also set before October 1. Each stone was set in a concrete base about 4 feet square and from 5 to 6 feet in depth below the surface of the ground. It is the intention in addition to setting the stones at highway and angle points, to also put drill holes on prominent rock ledges, giving them proper references, and to reset a number of the old monuments in a bed of concrete at points on the line where they will be of the greatest value in rerunning it.

The work remaining to be done includes the running of the line from Old Bound No. 43 north to the Massachusetts line, a distance of about 41 miles, and the setting of the remaining monuments, fifty of which are to be furnished by the State of Connecticut. It will be impossible to do the remaining work this season on account of lack of appropriation, the Legislature at its last session having failed to appropriate the full amount of money asked for to accomplish this work. The work to be done next year should include the remarking of the line along the Byram river from the "Great Stone" at the "Wading Place" south to Long Island Sound. This section was marked in 1856 by iron bolts set in the rock. Several of these bolts have been removed or destroyed and at present it is impossible for an engineer to locate the line, even approximately, without making a survey and recalculating the old scheme of angles.

Respectfully submitted,

H. W. DEGRAFF,
Deputy State Engineer.

REPORT

OF AN

INSPECTION OF AN ACCIDENT

TO THE

SAULT STE. MARIE CANAL LOCK

Report of an Inspection of an Accident to the Sault Ste. Marie Canal Lock.

Albany, N. Y., *June* 18, 1909.

Hon. Frank M. Williams, *State Engineer and Surveyor:*

Dear Sir.—According to your instructions, I made a careful examination of the Sault Ste. Marie canal and lock, Province of Ontario, Canada, with particular reference to the cause of the accident, which occurred there on June 9, 1909, and the means used to stop the flow of water and to put the lock in commission again.

The Canadian canal, which is on the north side of the St. Mary's river, is about 1⅛ miles long and 150 feet wide in its upper approach, with 21 feet of water at the ordinary stage. It has a lock 900 feet long between gates, having 21 feet of water on miter-sills and a lift of 19 feet. Its cost was $4,093,025.60. The construction was started in 1888 and the canal was completed in 1895.

As will be seen from the accompanying sketch, the lock is fitted with five pairs of gates — two upper and three lower. The two upper pairs consist of one set of guard-gates and one set of regular lock-gates. The upper guard-gates cannot be used for auxiliary gates, as there is a drainage culvert between these two pairs. At the lower, or easterly end of the lock there are three sets of gates, namely, the auxiliary, the regular lock-gates and beyond these a pair of low-level guard-gates, which are for use when pumping out and making repairs to the lock.

About 800 or 900 feet west of the lock and in the canal approach, is a movable dam of the swing bridge type which normally lies parallel to the canal. Attached to the lower chord by hinges are frames about 38 feet long by 6 feet 3 inches wide, made up of two girders braced by angle irons on the upper half and round rods riveted to the outside of the girders for the lower part. The frames are lowered by chains (the same as the Boulé gate type) and engage in a sill at their lower end. They have a sliding wicket about six inches thick, which has rollers attached and slides down in the frame.

The accident happened on Wednesday, June 9, 1909, at about 2 P. M. At 1:50 P. M. the C. P. R. Steamer *Assiniboi* (see sketch for positions of boats) had tied up ready for locking down and the U. S. Steel Company's freight steamer *Crescent City*, entering the lock from above to lock down, had partly cleared the lock sill, when the freight steamer *Perry G. Walker*, which had been maneuvering for a position ahead of the dredge in order not to be delayed in locking up, for some reason, not yet satisfactorily explained, increased her headway and rammed the north side lower gate, removing the support of the south gate, which gave way to the pressure behind it (a head of about 19 feet). Immediately the *Walker* was carried back, followed by the north gate and the *Assiniboi*, which rammed the *Walker*, the *Assiniboi* being followed in turn by the *Crescent City*, which struck the lower south gate where it had lodged by the guard-gate. The *Crescent City* also struck the *Assiniboi* two glancing blows, all three vessels being swept out into the St. Mary's river. The *Walker* was not seriously damaged, having a hole in her side above the water line. The *Assiniboi* had some of her plates sprung and later in the afternoon proceeded on her way, but the *Crescent City* sank soon after she was moored to her dock on the American side. The upper gates were open, that is, they were in the recesses, but not fastened. The force of the rushing water being great enough to swing them out into the current and tear them from their anchorages, they immediately followed after the *Crescent City*, which in going out settled enough to tear away the miter-sill, together with other protecting timbers and the sheave blocks located on the lock sill. Had she been a little farther back in the canal at the time of the accident, undoubtedly she would have been broken in two.

On Wednesday afternoon, immediately after the accident, the canal force started to put the movable dam in place. After the bridge was swung over the canal, the wickets were lowered in the following manner: There being 23 wickets, the middle one, or the twelfth wicket, was lowered first, leaving eleven on each side.

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Then the sixth wicket from each end was lowered, leaving four groups of five each. The gaps were again divided in the same manner, until the remaining wickets were lowered in place. The first four were placed very easily, but all the rest of the wickets had to be jacked into place. Probably the springing of the frames from the great pressure caused this resistance in sliding the wickets into place. Frame No. 6, in being lowered, caught on some slight obstruction on the sill; it was badly bent and also had a number of its bracing rods broken, so that its wicket could not be forced down. Accordingly this wicket was raised and 10 by 12-inch timbers, 20 feet long, were placed in the form of horizontal sheeting with a bearing on the adjacent frames and being slightly spiked. In order to keep the timbers from shifting in position, after the first few were placed, they had to be jacked down, thus forcing them over both the rivet heads and whatever bracing was outside of the frames. From this experience it was seen that all bracing should have been inside the frames, with rivets countersunk.

Even after this timber bulkhead was in position, there was a very large flow of water through the dam, principally due to the fact that some of the frames were sprung and a number of the wickets did not have an even footing. The opening between the frames, as designed, was 2 inches. In some cases the pressure made it 4 inches. To more effectively close these openings, 3 by 10-inch planks were placed over the openings between the frames to a depth of about 10 feet, also straw and earth in bags was forced down behind the dam, in order to better stop the leakage.

The movable dam was in position on Thursday afternoon, with all but a few wickets down, No. 6 not being in place at all. As stated, this space was timbered and other leakages provided for by Saturday night. On Sunday the lower auxiliary gates were rigged with extra tackle, in order to close them, which was hardly more than safely accomplished at 3:10 P. M. The upper guard-gates were closed by 5:00 P. M. At 2 A. M., Monday, the pumps were started and the locks were cleared of water by noon.

The damage, outside of the loss of the two pairs of gates, consisted in the injury done to the sill on which the upper gates rest. The miter-sill and protecting timbers were torn from their fastenings and carried away, the two sheave blocks and their tackle were missing and the lower edge of the masonry was taken off a foot back, having been sheared off along the line of a set of anchor bolts, which held one of the protecting timbers in place. The iron gratings over the drainage culvert had entirely disappeared and the culvert was partially filled with stones. The planking along the bottom of the canal was torn up for 25 feet at the upper end of the lock and most of the valve openings were filled with stone.

It is of interest to know that there was a deflection of 1¾ inches in the lower chord, after all the wickets, except No. 6 were placed. In placing the frames there was an unusual amount of vibration, both in frames and in bridge. To better show the amount of water passing through the movable dam, it may be stated that it took just forty-five minutes to fill the level after the lower gates were closed.

Through the courtesy of Mr. J. W. Le B. Ross, Superintending Engineer of the Sault Ste. Marie canal for the Dominion Government, I am indebted for a part of the information contained in this report and also for the following suggestions: That all locks should have fastening devices for gates, when open; that every alternate frame of a movable dam should have light steel plates overlapping the girder edges of the frames, so as to stop the excessive flow between frames; and that the catch basin in front of the sill of this type of movable dam should not be directly in front of the sill, but should be far enough back to provide a smooth flow up to the sill, in order that when making the dam water-tight by placing bags of earth or otherwise, catch basin will not have to be filled before the filling takes effect, and also in order that a uniform surface may be given on which to rest a timber bulkhead.

The total amount of damage done to the locks will come within $50,000, according to Mr. Ross, and he hopes to have the canal in commission again by the 19th of June, as they have a new pair of gates, which can be placed where the upper gates were.

The movable dam worked for the most part very satisfactorily, considering the fact that this was the first real test that it had had since it was installed twelve years ago.

The amount of water flowing through the canal right after the accident can be roughly determined from the following: The depth of water in the lock at this time was 24.8 feet. The average width for this depth of water was 60.2 feet and the surface velocity of the current was 14.6 feet per second. The surface velocity for this flow was taken, as this was the only accurate velocity measurement obtainable. Without making any correction for mean velocity, this gives a volume of about 21,650 cubic feet per second.

Respectfully submitted,
H. ELTINGE BREED,
Assistant Engineer.

A MEMORIAL

OF THE

FIRST BOAT TO NAVIGATE THE STATE CANALS

FROM

SENECA LAKE TO NEW YORK CITY

A Memorial of the First Boat to Navigate the State Canals from Seneca Lake to New York City.

The whereabouts of an interesting memorial of early canal days has recently come to light, and most opportunely, in view of the latest addition to the Barge canal system, the Cayuga and Seneca branch, for it commemorates the enterprise which prompted two farmers of Tompkins county to build a vessel near the head of Seneca lake in 1823 and carry to New York a boatload of wheat, the first to reach that market in bulk from so far in the interior.

An early writer of canal history, Cadwallader D. Colden, in speaking of this occurrence, says that "so happy an illustration of the advantages of the canals was not suffered to pass unnoticed by our citizens." In addition to the public entertainment, which he mentions, there was presented to these farmer-navigators a memorial of the occasion and of the event which it celebrated. But recently the existence and location of this souvenir have come to the knowledge of State canal officials. To give it a place in canal records, a few pages are here devoted to its description and photographic representation.

In fuller narration of this memorable trip the following excerpt may be quoted from the canal history published as a supplement to the State Engineer's annual report for 1905:

"In November, 1823, there arrived in New York a boat from Hector, at the head of Seneca lake, which attracted considerable attention. She had come by way of Seneca lake and Seneca river, through a private company's locks at Waterloo, from a point seventy miles south of the Erie canal and three hundred and fifty miles from New York. As an indication of the extent and importance of the benefits that would follow the opening of canals into the interior, this event was deemed worthy of notice, and her owners and navigators, two farmers of Tompkins county, were given a public entertainment."

"This vessel," says Colden, "was not only received as the precursor of a commerce, which will be unlimited in its extent and importance, but as an interesting evidence of the ingenuity and enterprise of our countrymen. Her timbers grew near where she was built; her proprietors were her architects; her cargo was the produce of the fields from whence she sprung, and she was navigated by those who cultivated them; her sails and rigging even, were emphatically domestic manufactures, for they were grown, and made, at the homes of her owners."*

This memento came to Katherine Seely, a daughter of one of the original recipients, and she bequeathed it to her daughter, Pauline Conklin Tuthill, who, before her death, gave it to her husband, Hiram Tuthill, of Chester, Orange county, N. Y., in whose possession it now is.

The souvenir, which is the form of an urn, stands thirteen inches high. In the band around the top are embossed agricultural scenes, depicting the cultivation of wheat from the breaking of the ground to the garnering of the ripened grain. These scenes are repeated in two other bands, one on either side of the middle. Just below the lower of these bands, is a circle of wheat sheaves, while another sheaf surmounts the lid.

On the obverse is inscribed the following legend:

> Presented by the undernamed Mfg. of Flour, in the City of N. Y., to John H. Osborne & Samuel S. Seely, of the Town of Hector, Tompkins Co., owners of the boat Mary & Hannah, to Commemorate their enterprise in having first Navigated the Western Canal & Hudson River from Seneca Lake to this City with a cargo of Wheat in bulk, New York, 1823.

Joshua Underhill & Son.
William Thorn.
Jared Peck.
Rogers & Jones.
Wood & Buckley.
David Lydig & Son.
Benjamin W. Coles.
Byrnes Trimble & Co.
Isaac Frost.
J. B. Whittelsey & Co.

On the reverse is engraved a view of New York harbor, with its steamships, ferry-boats and other craft, and in the center the "Mary and Hannah."

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* "Memoir prepared * * * at the celebration of the completion of the New York canals," p. 63.

Memorial presented to the navigators of the first boat to reach New York city from Seneca lake.

REPORT

OF

Coöperation of United States Geological Survey

WITH

STATE ENGINEER AND SURVEYOR

OF THE

STATE OF NEW YORK

1909

Coöperative Topographic Survey of New York.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY.

WASHINGTON, D. C., *January* 20, 1910.

Hon. FRANK M. WILLIAMS, *State Engineer and Surveyor, Albany, New York:*

Dear Sir.— I have the honor to make the following report of the results of the coöperative topographic survey of New York for the fiscal year 1909–10, to and including December 31, 1909:

Allotments.

The agreement signed by the Director of the U. S. Geological Survey and the State Engineer and Surveyor of New York on June 28 and July 10, 1909, respectively, provided for the continuation of the coöperative topographic survey of the state and for the expenditure of $7,000 by each of the contracting parties during the Government fiscal year ending June 30, 1910. Of the sum provided for coöperative surveys during the preceding fiscal year there remained at the beginning of the field season of 1909, $2,538.50, making the total sum available to June 30, 1910, $16,538.50. Of this sum there had been expended on January 1, 1910, $11,497.69, leaving a balance on the part of New York of $831, and the U. S. Geological Survey of $4,209.81, or a total of $5,040.81, to be expended for the payment of office salaries involved in the drafting of maps and for the preliminary field work of 1910.

Results.

The coöperative topographic work in New York was continued under the immediate supervisory charge of Mr. Frank Sutton, Geographer in charge of the Atlantic Division, the general charge of all such work of the United States Geological Survey being under Mr. R. B. Marshall, Chief Geographer.

During the season of 1909 surveys were made in St. Lawrence, Jefferson, Delaware, Otsego and Chenango counties, and resulted in the completion of the Antwerp, Delhi, Monticello and Neversink quadrangles, and the partial completion of the Hartwick and Hammond quadrangles. Preliminary work was continued on the Canton quadrangle and commenced on the New Berlin quadrangle. The total area mapped was 595 square miles for publication on the scale of 1 : 62,500, with a contour interval of 20 feet.

For the control of the above areas 56 miles of primary levels and 1,470 miles of secondary levels were run, in connection with which 17 permanent and 278 temporary bench-marks were established. In addition 1,378 miles of secondary road traverse were run.

Progress to Date.

Prior to the season of 1909–10 there had been surveyed and mapped 211 quadrangles. At the conclusion of the present field season, therefore, 215 atlas sheets had been completed and 2 partially completed, representing the topography of 40,039 square miles. The total area of the State is 49,204 square miles, thus leaving 9,165 square miles yet to be mapped.

Field Work in 1909.

Field work was commenced in May by Messrs W. H. S. Morey and J. M. Whitman, assistant topographers, and in June by Mr. R. C. McKinney, topographer, who completed the survey of the Monticello, Neversink, Antwerp, and Delhi quadrangles. In July Mr. R. D. Cummin, topographer, and Mr. J. R. Haswell, junior topographer, also took the field, and in conjunction with those above mentioned, accomplished the partial mapping of the Hartwick and Hammond quadrangles. Preliminary work was continued on the New Berlin and Canton quadrangles by Mr. L. C. Fletcher, topographer, and Mr. Morey.

Office Work.

The final drawing of the Antwerp, Delhi, Monticello and Neversink topographic sheets will be completed during the spring and will then be transmitted to the engraving division for publication. These, with the Bath and Stony Creek, are the only atlas sheets completed in New York that have not been engraved.

The Cooperstown sheet was published during the year 1908.

Very respectfully,

GEO. OTIS SMITH,
Director.

REPORT

OF

Records and Gagings

AND

Discharge of Streams

IN THE

STATE OF NEW YORK

1909

By ROBERT E. HORTON,
Resident Engineer

Report on the Gaging of Streams for 1909.

HON. FRANK M. WILLIAMS, *State Engineer and Surveyor:*

Dear Sir.— The following report contains the results of observations of water-levels along the lines of the Barge canal as well as at gagings stations maintained in coöperation with the United States Geological Survey for the purpose of determining the discharge of streams throughout the state during the year 1909. About ninety gages have been maintained in connection with the Barge canal department, under the immediate direction of Mr. Wm. B. Landreth, Special Deputy State Engineer. The mean daily elevations of water-surface at the different stations are published in this report. The discharge is determined at a few of these gaging stations. The methods used being analogous to those employed by the U. S. Geological Survey and hereafter described. As a rule two observations of water-level are made each day and the mean of the two has been used in determining the elevation of water-surface. Stations at Cohoes, Hoosick Falls, Glens Falls, Northville, Schaghticoke, Fort Hunter, Schenectady, Corinth, Utica, Troy, Trenton Falls, Schoharie Junction and State Dam, Little Falls, are maintained during the four winter months, December to March, inclusive, by the U. S. Weather Bureau, under the direction of Mr. George T. Todd, Local Forecaster.

The work of stream gaging in connection with the Barge canal was under the general supervision of C. Arthur Poole, First Assistant Engineer, preceding July, 1906, and of Robert E. Horton, Resident Engineer, subsequently.

Most of the stations maintained by this Department are solely for the purpose of recording the water-level, and are not used to determine the discharge. In such cases readings are taken only to the nearest one-tenth foot. The elevations of the gage zeroes and the water-surface elevations deduced from the gage readings are determined with reference to the Barge canal datum.

An annual appropriation for stream gaging in coöperation with the U. S. Geological Survey was made by the State Legislature in each of the years 1900 to 1904, inclusive, and again from 1906 to 1909, inclusive. The results of this work, which was carried on under the joint direction of the Division of Hydrography of the Geological Survey and the State Engineer and Surveyor, have been published in the reports of the State Engineer and Surveyor. During 1909 this work has been in charge of C. C. Covert, District Engineer, U. S. Geological Survey.

METHODS EMPLOYED.

In the establishing of gaging stations no single method of gaging has been employed to the exclusion of others. In many instances two or more methods have been combined at a single station. The principal methods have been the use of dams as weirs in conjunction with records of the flow through turbines or other outlets at mills, and the current-meter method. Gagings by thin-edged weirs and through thin partitions or orifices have been used to some extent in the case of small streams. Surface-floats, rod-floats and the surface-slope methods are also used in cases where other methods cannot be utilized.

The gages at the coöperative stations are chiefly cypress planks with galvanized staple division marks and brass figures. At the Barge canal stations the original gages were mostly ⅞-inch boards, with painted or burned division marks or figures.

At present most of the gages maintained by the Barge canal department are made in sections from enamelled steel strips, subdivided decimally in 1-10 foot widths. Weight-and-chain gages have been uniformly equipped with standard chain, standard adjustable weights and standard locks. Tape-and-reel gages, U. S. Weather Bureau pattern, are also used.

In determining the discharge at dams and mills the method of procedure is as follows: A profile of the crest of the dam is obtained and is divided into sections, all points in a given section being nearly or precisely at the same elevation. The discharge over each section is computed for a series of crest-depths, ranging from zero to the extreme high-water mark. The summation of these sectional discharge curves furnishes data for a rating table for the entire dam, from which the volume of flow corresponding to any gage height can be read directly. When flash-boards are placed on dams, the conditions are reduced more nearly to those of a standard thin-edged weir, and Francis' well-known formula has been used in computing the discharge. The flow over waste-weirs, auxiliary spillways and flood overflows has been calculated in a manner similar to that used for dams. The amount of flow through head-gates, sluiceways, feeder gates and similar openings has been calculated from the formula for orifices.

In estimating the discharge through turbine water-wheels the results of tests, made at the testing flume of the Holyoke Water Power Company, have been largely depended upon, the mean discharge for each day having been computed from the observed working head, width of opening of speed gates and number of hours each wheel has run. A record of these facts is kept at each of the stations where there are mills in connection with dams.

One difficulty encountered in gaging northern streams results from the accumulation of ice during the winter season. It has been found impossible to keep some dams clear of ice, and an effort is made to keep a record of the length of the clear and unobstructed portion of the dam, from which a correction in the calculated flow can be made.

The method of gaging at dams and mills and the necessary data for the calculation of discharge over weirs or through turbines may be found in the water-supply and irrigation papers of the U. S. Geological Survey, Nos. 150 and 200.[a]

For current-meter gaging stations a modified form of small Price meter has generally been used.

By courtesy of the owner, arrangements were made during 1907 to rate the current-meters used by the Department at an unused canal slip in the Albany lumber district. For the purpose of rating meters a track 120 feet long was laid alongside the canal slip. The meter to be rated is suspended from an outrigger attached to a car that runs on the track. The car is drawn at a uniform velocity along the track by means of a windlass and tackle. The car is run at various speeds covering the ordinary range of velocities occurring in rivers and canals and the time required and number of revolutions of the meter wheel during each run are recorded. From this data a rating table for the current-meter is prepared, by means of which the velocity of flow of a stream can be deduced from the observed revolutions per second of the meter wheel.

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[a] "Weir Experiments, Coefficients and Formulas" and "Turbine Water Wheel Tests and Power Tables," by Robert E. Horton.

In making gagings of streams the usual method of procedure is to divide the stream into subsections usually of 5 to 10 feet width. The velocity is usually measured at the median point of each subsection by means of the current-meter, the meter wheel usually being submerged six-tenths of the depth of the stream. The revolutions of the meter wheel are recorded for a period of 100 seconds. The time is noted by means of a stop-watch reading to one-fifth second and the period of observation is usually subdivided into two intervals of fifty seconds each. Careful soundings are taken at times when the conditions are favorable and standard cross-sections are prepared therefrom, from which the areas of the subsections can be taken out more accurately than from the individual soundings made in connection with the meter measurements. A simple multiplication of the velocity in each subsection by the cross-sectional area to which it applies gives the rate of discharge for the subsection. A summation of the quantities for the several subsections gives the total measured volume of flow. A river-height gage is established at each current-meter station, from which the stage of the stream is observed once or twice daily. Current-meter measurements of the discharge are made from time to time as opportunity permits. After a sufficient number of discharge measurements have been made they are plotted, using the gage heights of the stream as ordinates and the measured discharges as abscissas. A mean curve is drawn through the plotted points showing the discharge rate in second-feet as a function of the gage reading. By means of this curve the average discharge rate for each day is deduced from the record of the height of the stream kept by the gage reader.

Gages are read each morning and night as a rule, although in some cases readings are taken only once daily. Readings are taken as a rule only to the nearest tenth or half-tenth of a foot. In some cases where there are two or more gages in a reach of a stream in which the slope is very slight, the mean daily elevation of the down-stream gage will on some days be higher than that shown by the up-stream gage. These differences are usually only a very few hundredths of a foot and result from various causes, including the error due to reading gage to nearest tenth foot, change in water-level between the time of reading the two gages, change in slope due to rising or falling of the stream between the two daily readings used in compiling the mean, effect of wind, etc. Instances of this character will be observed on Hudson river above Crocker's Reef dam and on Oneida and Seneca rivers, and where the differences are small they are not the result either of errors in readings or the use of an erroneous gage datum.

At some locations where discharge data are required, it is impossible to obtain a permanent rating table owing to continued or irregular changing of the regimen of the stream by backwater from dams, ice or log obstructions, or from the growth of aquatic vegetation. At such locations the discharge is determined from such measurements as can be made with corrections of the gage heights determined from a comparison of the discharge at different times.

The principal sources of error in gaging streams by the current-meter method are due to the effect of slack, or nearly slack water in any part of the cross-section, or to backwater from dams, from obstructing ice, or from tributaries entering below the gaging station, thereby causing the river stage to rise at times without a proportional increase in the discharge. In accordance with the well-known Kutter formula, the volume of flow in an open channel is a function of the slope, the area of cross-section and the wetted perimeter. When a stream is rising, the slope is usually greater at a given stage of the stream than at the same stage when falling. Northern streams, as a rule, rise rapidly and fall gradually, so that the stream is falling on the majority of days of the year. The error from the above source is small, inasmuch as the discharge varies only as the square root of the slope. The principal difficulty encountered results from the freezing over of streams in winter. The ice serves greatly to increase the wetted perimeter of the measuring section, thereby modifying the rating curve. Whenever practicable, discharge measurements during winter months are made through the ice.

When streams are ice-covered, an opening is kept underneath the gage and the gage reading is taken directly to water-surface level, as in summer. A record is also kept of the ice thickness in inches.

The accuracy of individual current-meter measurements depends chiefly upon the number of the velocity observations and soundings taken in the cross-section. During freshets and at times when ice or debris is floating on the stream's surface, the current-meter cannot be submerged to a six-tenths depth, and readings are taken by holding the meter about one foot below the surface. As a check on the accuracy of the general results and to determine suitable coefficients for the estimation of the mean velocity from that obtained by current-meter, vertical velocity curves are made from time to time.

Owing to the conditions above described and other unfavorable characteristics of New York streams, the difficulty of maintaining continuous gaging records, which will show with sufficient accuracy the discharge rate day by day throughout the year, is very great. This is especially true in streams whose discharge fluctuates between wide limits.

In many cases methods of gaging applicable at low and ordinary stages may not give equally reliable results during freshets; or the reverse may be true, the results being most accurate for high water.

For mill streams, where the water is held back as pond-storage during the dry season, it is impossible to determine the natural regimen of flow of the stream. This is especially true with reference to Sundays and holidays, when mills are not running. If, at any time, the water-wheels are stopped when the water stands below the level of the crest line of the dam, the flow in the stream channel below will be *nil*, or at best, will equal only the leakage of the dam, flumes, or penstocks.

The relation existing between the canals of New York and the streams of the central portion of the state is very complex. Diversion from the head waters of a number of streams for the supply of canals virtually reduces their effective drainage areas. As a result, the summer watershed may be materially less in area and differ widely in its water-yielding characteristics from the region tributary to the stream when the canals are not in operation.

In this connection attention should be called to the maximum daily discharge for each month as given in the following report. This is obtained from the mean of the gaging readings on the day of maximum discharge. As a rule, the discharge at some time in the course of the day was considerably greater than the average for the twenty-four-hour period.

In connection with the gaging stations it is necessary to employ, as observers, persons living near the site selected for the measuring section — those who, as a rule, have had no previous experience in similar work. Their observations are forwarded at the end of each week. As a check on the records so obtained, inspection trips are made at frequent intervals and independent gage readings taken by the hydrographer. The close agreement found in most cases testifies to the intelligent and careful work of the observers.

ST. LAWRENCE RIVER DRAINAGE.

GENERAL FEATURES.

St. Lawrence river receives the flow of a number of New York streams having their sources in a northerly slope of the Adirondacks and fed by the numerous lakes with which the region is dotted. Some of these rivers, as the Grass, Raquette and St. Regis, lie entirely within the United States; others, notably Salmon, Trout, Chateaugay and English rivers, cross the international boundary and flow northward into the St. Lawrence in Canada, as does also Richelieu river, the outlet of Lake Champlain. The following table gives a list of the principal tributaries of the St. Lawrence in the United States, with the areas drained by them determined chiefly from Bien's Atlas of the State of New York.

Drainage Areas of St. Lawrence River tributaries in the United States.

	Square miles.		Square miles.
Oswegatchie river	1,609	Salmon river [a]	273
Grass river	637	Trout river [b]	129
Raquette river	1,219	Chateaugay river [b]	199
St. Regis river	910	English river [b]	53
Little Salmon river [a]	103	Lake Champlain [b]	7,867

[a] Above junction near international boundry. [b] Above outlet at New York state line.

The St. Lawrence drains, through Lake Champlain, an area of 4,560 square miles in the State of Vermont. This drainage is practically all from Missisquoi, Lamoille and Winooski rivers and Otter creek.

LAKE CHAMPLAIN DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Lake Champlain occupies a long and narrow valley, extending in a north-south direction and forming a part of the boundary between New York and Vermont. The elevation of the lake is about ninety-five feet above tide and the water-surface area is 436 square miles.

The drainage basin is irregular in form, being about seventy-five miles wide from a point opposite Middlebury, Vt., northward to the outlet of the lake at Rouses Point, on the international boundary. South of Middlebury the average width of the basin is about thirty-five miles and the lake itself is very narrow, forming virtually a drowned river.

The tributary region is rugged and mountainous, mostly covered with forest and with little depth of soil except in the stream valleys. The drainage is received almost entirely through large tributaries, there being little direct coast drainage into the lake. The outlet of the lake is Richelieu river, which flows northward from Rouses Point to St. Lawrence river.

In estimating the run-off from this basin in previous years the drainage area has been taken as 7,750 square miles. Maps have recently become available from which the area of the lake and its tributary drainage basin have been more accurately determined, as shown in the following table:[*]

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[*] Table here presented is a revision of that appearing in the 1907 report.

Drainage Areas Tributary to Lake Champlain.

LOCALITY.	AREA IN SQUARE MILES.		
	Place to place.	Sub-total.	Total.
Pike river and adjacent area in Canada		[a]242.0	
Missisquoi river in Canada		[b]245.0	
Land area in Canada above outlet			487.0
Missisquoi river in Vermont		[b]615.0	
(Total Missisquoi river, 860 square miles.)			
Lamoille river		[b]725.0	
Winooski river		[b]995.0	
Otter creek		[b]935.0	
Eastern coast drainage		[b]534.4	
Mettawee, Poultney and Castleton rivers in Vermont		[c]376.0	
Land area in Vermont, except islands			4,180.4
Wood creek above Smiths Basin	18.6		
Big creek above junction with Wood creek	35.16	53.76	
Wood creek, Smiths Basin to Fort Ann	9.9	63.66	
Halfway creek above Kane's falls	78.82		
Halfway creek, Kane's falls to junction with Wood creek at Fort Ann	6.69	85.51	
Wood creek at Fort Ann, including Halfway creek		149.17	
Wood creek, Fort Ann to junction with Mettawee	55.73	204.90	
Mettawee river in Vermont	151.9		
Mettawee river in New York	55.7		
Total, Mettawee river		207.6	
Total, Wood creek and Mettawee river at junction		412.5	
Wood creek junction Mettawee river to Whitehall	13.65	426.15	
Wood creek, Whitehall to junction with Poultney river	1.65	427.8	
Castleton river, in Vermont	100.9		
Poultney river, including Castleton river in Vermont		254.8	
Poultney river in New York		11.0	
Poultney river, total to junction with Wood creek		265.8	
Total, Wood creek and Poultney river at junction			693.6
Wood creek, Mettawee and Poultney rivers in New York			286.9
Lake George outlet		220.1	
Bouquet river		[c]268.1	
Ausable river		[d]521.3	
Little Ausable river		[d]75.1	
Saranac river		[d]629.6	
Little Chazy river		[c]63.8	
Big Chazy river		[d]299.4	
Western coast drainage		[d]344.6	

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[a] From maps of Canadian Geological Survey. Scale: 4 miles 1 inch.
[b] United States post-route maps. Scale: 12.5 miles = 1 inch.
[c] Topographic maps of U. S. G. S. Scale: 1 mile = 1 inch (nearly).
[d] Bien's Atlas of New York. Scale: 2.5 miles = 1 inch.
[e] Charts of U. S. Coast and Geodetic Survey. Scale: 1 : 40,000.

Lake Champlain Drainage — (*Continued*).

LOCALITY.	AREA IN SQUARE MILES.		
	Place to place.	Sub-total.	Total.
Land area in New York, except islands	....	....	2,708.9
Islands in New York	....	*e*55.2	....
Total land area above outlet	....	....	7,431.5
Water-surface in Canada	....	*e*16.5	....
Water-surface in United States	....	*e*419.1	....
Total water-surface	....	435.6	....
Total drainage area above outlet	....	....	7,867.1
Richelieu river, Rouses Point to Chambly	*a*310.0	....	....
Total drainage area above Chambly	....	....	8,177.1
Richelieu river, Chambly to mouth	*a*626.3	....	....
Richelieu river, total	....	936.3	....
Total drainage area above mouth	....	....	8,803.4

a From maps of Canadian Geological Survey. Scale: 4 miles = 1 inch.
e Charts of U. S. Coast and Geodetic Survey. Scale: 1 : 40,000.

MISCELLANEOUS MEASUREMENTS, LAKE CHAMPLAIN DRAINAGE BASIN.

A current-meter measurement of the discharge of Bouquet river near the site of the gaging station formerly maintained at Willsboro, N. Y., was made by C. C. Covert, July 16, 1909. The stage of the stream as shown by the gage was 1.95 and the discharge 82 second-feet.

Measurement of the east branch of Au Sable river was made at Au Sable Forks, October 20, 1909, by C. C. Covert. The stage of the stream was 18.65 feet below a reference point on top of the bridge guard-rail, down-stream side of bridge at right-hand side of first post brace on right-hand end of bridge. The discharge was 57.5 second-feet.

RICHELIEU RIVER AT FORT MONTGOMERY, N. Y.

A record of the height of Lake Champlain at Rouses Point, at the head of Richelieu river, the outlet of the lake, has been kept at Fort Montgomery, by the United States Corps of Engineers, beginning in 1875. Through the courtesy of Capt. Harry Taylor, the gage readings taken by William McComb, the fort keeper, at 9 A. M. each day, are reported weekly to the United States Geological Survey.

The depth of the water is taken on a reference mark on the base of the scarp wall, at the north face of bastian B, about three feet from the angle with the east curtain of Fort Montgomery. This reference point is 1.50 feet above an assumed zero, and 1.50 is added to the measured depth to determine the gage reading. In winter the depth as the water rises in a hole in the ice is commonly taken. On windy days the depth is taken in a well within the fort inclosure by measuring the depth on a flagstone in the bottom of the well.

Elevations at Fort Montgomery.

	Feet above tide.
Elevation of reference point on scarp wall of Fort Montgomery[a]	94.998
Elevation of gage zero	93.501
Assumed high water, Lake Champlain	102.611
Assumed low water, Lake Champlain	93.361

The range of rise and fall of the lake is thus seen to be 9.25 feet, representing an available storage volume of about six inches on the entire catchment area above the outlet.

The land drainage area above Rouses Point is 7,432 square miles. The water-surface of the lake is 436 square miles, making the total area at the foot of the lake 7,867 square miles.

The daily discharge of the lake has been determined from observations of the depth and discharge over the Chambly dam, thirty-five miles below the head of Richelieu river, made in 1898 by the United States Board on Deep Waterways. A rating table has been derived from the observations at the Chambly dam and the gage readings taken at Rouses Point. The area tributary to the river between Rouses Point and Chambly is 310 square miles, making the total drainage basin above Chambly, 8,177 square miles.

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[a] United States Deep Waterways report, part 1, p. 429.

Mean Daily Gage Height, in Feet, of Richlieu River at Fort Montgomery, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	......	93.65	95.80	96.40	99.80	98.40	96.05	94.35	93.50	93.25	92.90	93.00
2	......	93.70	95.80	96.50	99.50	98.35	95.90	94.30	93.50	93.20	93.00	93.00
3	......	93.75	95.85	96.60	99.40	98.20	95.90	94.25	93.50	93.20	92.90	93.00
4	......	93.75	95.80	96.65	99.30	98.15	95.80	94.30	93.60	93.25	92.85	93.00
5	......	93.75	95.80	96.80	99.25	98.10	95.70	94.25	93.40	93.30	92.80	93.05
6	......	93.80	95.90	97.00	99.15	97.95	95.70	94.20	93.45	93.30	92.80	93.00
7	......	93.95	95.85	97.35	99.35	97.90	95.60	94.10	93.30	93.30	92.85	93.05
8	92.70	94.10	95.90	97.65	99.15	97.85	95.50	94.15	93.40	93.30	93.00	93.10
9	92.75	94.10	95.95	98.00	99.30	97.80	95.45	94.05	93.20	93.25	92.80	93.20
10	92.80	94.25	96.00	98.25	99.40	97.70	95.50	93.95	93.40	93.30	93.00	92.95
11	92.85	94.35	95.95	98.40	99.50	97.60	95.45	93.95	93.30	93.35	92.95	93.00
12	92.80	94.40	95.90	98.50	99.60	99.50	95.45	94.00	93.30	93.30	92.90	93.00
13	92.75	94.35	95.90	98.60	99.65	97.40	95.30	94.05	93.35	93.30	92.85	93.10
14	92.80	94.35	95.90	......	99.65	97.35	95.20	93.95	93.25	93.35	92.85	93.00
15	92.70	94.40	95.90	......	99.40	97.20	95.20	94.00	93.35	93.15	93.10	93.10
16	92.80	94.40	95.95	......	99.45	97.15	95.15	94.00	93.20	93.20	92.80	93.05
17	92.70	94.55	95.90	......	99.50	97.20	95.05	93.80	93.30	93.10	93.00	93.00
18	92.80	94.60	95.80	......	99.50	97.05	95.05	93.75	93.10	93.10	92.70	93.00
19	92.85	......	95.85	......	99.55	97.00	94.85	93.80	93.20	93.00	92.80	93.00
20	92.90	94.65	95.75	......	99.55	96.95	94.80	93.75	93.30	93.05	92.95	93.00
21	92.95	94.90	95.70	......	99.50	96.85	94.85	93.70	93.20	93.10	92.85	92.95
22	92.90	95.05	95.65	......	99.40	96.80	94.95	93.75	93.20	93.00	92.75	93.00
23	93.00	95.10	95.60	100.00	99.25	96.70	94.90	93.75	93.15	93.00	92.80	93.00
24	93.20	95.75	95.70	99.90	99.10	96.60	94.80	93.75	93.10	92.90	92.75	92.95
25	93.40	95.45	95.70	99.95	98.95	96.55	94.65	93.70	93.05	92.95	92.80	93.05
26	93.55	95.60	95.80	99.70	98.90	96.45	94.65	93.70	93.00	93.10	92.90	92.90
27	93.60	95.65	95.85	99.90	98.85	96.30	94.60	93.55	93.05	93.00	92.90	92.95
28	93.60	95.70	95.95	99.45	98.80	96.30	94.55	93.65	93.10	93.00	93.10	93.00
29	93.55	......	96.10	99.50	98.70	96.10	94.65	93.55	93.25	92.85	92.85	93.00
30	93.55	......	96.20	99.60	98.60	96.10	94.35	93.55	93.20	92.80	92.95	93.00
31	93.60	......	96.30	......	98.55	......	94.40	93.65	......	92.90	......	93.00

NOTE.— Gage datum, 92.50.

Computations of daily discharge and run-off for 1909 are withheld, pending the acquisition of additional data.

WOOD CREEK DRAINAGE BASIN.

DESCRIPTION.

Wood creek flowed originally along a tortuous course in a flat valley skirted by bold slopes, the general course being northerly from a point five miles east of Hudson river at Fort Edward. From Smiths Basin northerly, it is alternately paralleled by and canalized to form Champlain canal, so that the flow of this portion of the stream is artificially controlled.

Half Way creek, the principal tributary of Wood creek, from the west, enters at Fort Ann. This stream receives the drainage from Putnam mountain and an adjacent group of small lakes. A fall of 60 feet occurs at Kanes Falls. Wood creek is joined by Wettawee river a short distance above Whitehall. The drainage from Poultney and Castleton rivers enters the arm of Lake Champlain through which Wood creek flows below Whitehall.

WOOD CREEK BELOW DAM AT WHITEHALL, N. Y.

A gage has been maintained by this Department below the dam at Whitehall since January 22, 1905. This gage gives a record of the fluctuation in level of water in the arm of Lake Champlain into which Wood creek discharges.

The original gage, erected by Mr. D. B. LaDu, was attached to the face of the Champlain Silk Mill on the right-hand side of the stream below the dam. A new gage attached to the face of the timber docking below the dam on the left-hand side of the stream is now used. The zero mark of each gage is at elevation 73.0, Barge canal datum. The observer and time of reading are the same as for the gage above the dam.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Wood Creek (a) *below Dam at Whitehall, N. Y.*

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	94.05	94.65	94.15	96.90	102.00	99.90	97.80	96.40	96.60	95.80	95.60	95.90
2	94.20	94.65	94.05	96.80	102.25	99.50	97.65	96.40	96.25	95.90	95.50	96.10
3	94.35	94.65	93.75	96.70	102.25	99.00	97.65	96.35	96.10	95.80	95.40	95.90
4	94.35	94.55	93.60	96.65	102.35	99.00	97.80	96.65	96.10	95.60	95.40	95.90
5	94.45	94.60	93.65	96.60	102.30	98.80	97.60	96.40	96.50	95.60	95.60	95.90
6	94.55	94.75	93.65	96.60	102.35	98.80	97.60	96.40	96.30	95.65	95.50	95.90
7	94.75	94.95	93.75	97.05	102.40	98.75	97.45	96.20	96.20	95.45	95.80	95.70
8	94.70	94.95	93.75	97.45	102.35	98.60	97.45	96.30	96.20	95.60	95.60	95.80
9	94.65	95.05	93.90	97.50	102.25	98.60	97.15	96.20	96.10	95.60	95.30	95.80
10	94.05	95.05	94.05	97.60	102.25	98.80	97.15	96.10	96.10	95.70	95.40	96.00
11	93.93	94.90	94.25	97.85	102.35	98.65	97.00	96.10	96.00	95.70	95.80	95.90
12	93.90	94.75	94.35	98.30	102.20	98.60	96.80	96.05	96.05	95.50	95.80	95.90
13	93.90	94.80	94.35	99.25	102.15	98.45	96.80	96.20	96.10	95.40	95.80	95.90
14	93.80	95.10	94.85	99.45	102.05	98.45	96.75	96.00	96.00	95.60	96.10	95.90
15	93.80	95.40	95.00	100.10	102.00	98.45	96.60	96.55	95.90	95.70	96.30	95.90
16	93.90	95.65	95.15	100.70	102.20	98.55	96.60	96.40	95.80	95.80	96.20	96.00
17	94.05	96.15	95.70	101.50	102.40	98.45	96.55	96.40	95.90	95.70	95.90	95.90
18	94.05	96.20	96.30	102.10	101.90	98.45	96.60	96.20	95.90	95.60	95.80	95.90
19	93.95	96.65	96.55	102.70	101.80	98.20	96.60	96.20	95.90	95.50	96.10	c
20	93.95	96.80	96.85	b	101.80	98.15	96.60	96.20	96.10	95.50	96.40	c
21	93.95	97.00	97.00	b	102.10	98.10	96.40	96.10	96.00	95.40	96.30	c
22	94.05	96.65	97.00	b	102.00	98.15	96.40	96.50	96.10	95.50	96.20	c
23	94.05	96.60	97.15	b	101.60	98.05	96.60	96.50	96.10	95.60	96.30	c
24	94.55	96.15	97.50	102.70	101.30	97.90	96.60	96.35	95.90	95.50	96.00	c
25	94.95	96.65	97.65	102.75	101.20	98.10	96.60	96.35	96.00	95.30	96.20	c
26	95.00	95.90	97.80	102.80	101.00	98.20	96.60	96.30	95.90	95.30	96.40	c
27	94.90	95.50	97.90	102.60	100.90	97.90	96.50	96.10	95.90	95.40	96.00	c
28	94.65	95.20	97.55	102.40	100.80	97.90	96.40	96.10	95.70	95.30	96.10	c
29	94.60	......	97.45	102.40	100.60	98.00	96.40	96.35	95.70	95.20	95.70	c
30	94.55	......	97.15	102.20	100.60	97.80	96.60	96.20	95.80	95.30	95.70	c
31	94.45	......	97.00	......	100.40	......	96.60	96.20	......	95.50	......	c

a Arm of Lake Champlain. *b* Gage submerged. *c* No record.

WOOD CREEK ABOVE DAM AT WHITEHALL, N. Y.

A record of the stage of Wood creek has been kept since September 19, 1904, when a gage was established above the stone dam of the Champlain Silk Mill, by D. B. LaDu of this Department. The gage board was formerly fastened to retaining wall on east side of the creek, near Clinton avenue, about seventy feet above the right-hand end of the dam. The present crest gage is located in the right-hand abutment of the dam. The gage is graduated in feet and tenths and is read twice daily. The zero of gage is placed at same elevation as crest of dam, the elevation of which is 107.5. The gage was read by S. H. Pearson preceding October 16, 1908, after which date the observer was Howard L. May.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Wood Creek above Dam at Whitehall, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	110.15	110.15	109.55	109.70	109.95	108.90	107.95	108.40	107.95	108.15	108.60	109.50
2	110.15	110.05	109.45	110.50	110.15	108.95	107.95	108.40	107.90	108.25	108.80	109.30
3	110.15	110.05	109.25	110.45	110.25	108.90	108.70	108.25	107.95	108.20	108.65	109.40
4	110.25	110.05	109.30	110.35	110.30	108.80	109.05	108.10	108.05	108.10	108.60	109.20
5	110.30	110.15	109.15	110.20	110.30	108.90	108.95	108.10	108.25	108.15	108.45	110.20
6	110.45	110.25	108.75	110.30	110.55	108.90	108.70	107.90	108.05	108.20	108.40	110.00
7	110.55	110.45	108.85	110.50	110.85	108.85	108.95	108.10	108.00	108.10	109.00	110.00
8	110.45	110.45	108.85	110.75	110.85	108.80	108.75	108.30	107.95	108.05	108.80	109.80
9	110.35	110.60	108.75	110.35	110.65	108.70	108.60	108.15	107.95	108.05	108.80	109.40
10	110.25	110.45	108.95	110.05	110.65	108.70	108.45	107.95	107.90	108.80	108.60	109.60
11	110.15	110.45	109.10	110.00	110.85	108.65	108.80	108.15	107.70	108.50	108.70	109.80
12	110.20	110.35	108.95	109.75	110.65	108.55	108.45	108.10	107.50	108.80	108.50	109.80
13	110.25	110.30	108.85	109.45	110.50	108.55	108.40	107.90	108.20	108.60	108.50	109.60
14	110.15	110.15	108.95	109.55	110.35	108.45	108.40	107.90	108.00	108.60	109.40	109.40
15	110.05	110.80	109.00	110.20	110.30	108.45	108.25	108.40	107.80	108.40	109.60	109.20
16	110.15	111.30	109.15	111.15	110.30	108.35	108.25	108.60	107.80	108.60	109.60	109.40
17	110.25	111.60	109.15	111.80	110.75	108.25	108.15	108.80	107.65	109.00	109.60	109.70
18	110.15	111.80	109.25	110.60	110.95	108.25	108.40	108.60	107.65	108.80	109.80	109.70
19	110.25	112.10	109.25	110.00	111.05	108.15	108.20	108.40	108.40	108.80	109.80	*b*
20	110.25	112.30	109.35	109.80	111.10	108.25	108.20	108.20	108.20	108.60	109.40	*b*
21	110.25	*a*	109.55	109.40	110.95	108.35	108.00	108.40	108.10	108.50	110.20	*b*
22	110.25	112.35	109.45	109.80	110.50	108.25	108.00	108.60	107.90	108.60	110.00	*b*
23	110.35	112.15	109.60	109.50	110.20	108.30	107.75	108.40	107.90	108.70	109.80	*b*
24	110.45	111.70	109.80	109.55	110.00	108.35	107.90	108.40	108.10	108.90	109.70	*b*
25	110.55	112.30	110.40	109.40	109.90	108.30	108.00	108.20	108.05	108.80	109.60	*b*
26	110.60	111.40	111.20	109.40	109.70	108.35	107.90	108.10	108.20	108.60	109.80	*b*
27	110.40	111.00	112.00	109.60	109.60	108.25	107.75	108.10	108.05	108.45	110.10	*b*
28	110.30	110.20	111.60	109.95	109.25	108.15	107.80	108.20	108.00	108.35	109.80	*b*
29	110.25	......	111.60	109.95	109.20	108.00	107.80	108.30	108.05	108.50	109.60	*b*
30	110.20	......	111.45	110.20	109.05	107.95	107.80	108.10	108.15	108.40	109.40	*b*
31	110.10	......	110.85	......	108.90	......	108.00	108.10	......	108.80	......	*b*

a Gage submerged. *b* No record.

SARANAC RIVER.

DESCRIPTION.

Saranac river rises in southeastern Franklin county, and flows northeastward to a point near Cadyville and thence eastward into Lake Champlain at Plattsburg. The southern boundary of the basin is the Ampersand mountain range, and the stream drains the north slope of the most elevated region of the State of New

York. About 16.2 per cent of the upper drainage area is water-surface. The areas tributary to the river are shown in the following table:

Drainage Areas of Saranac River. [a]

LOCATION.	Area.	Total area.
	Square miles.	*Square miles.*
Above Saranac lake State dam	....	157.5
Above Saranac Lake village	44.9	202.4
Above Franklin Falls	104.3	306.7
North Branch Saranac river	136.6	136.6
At junction North branch	....	498.8
Above High Falls	19.6	518.4
Above Cadyville	74.6	593.0
Above Kent Falls	2.9	595.9
Above Morrisonville	2.0	597.9
Above Lozier dam	26.1	624.0
Above mouth	5.6	629.6

[a] From Bien's Atlas of New York.

The results of gagings of Saranac river at a station formerly maintained at Saranac lake are given in the report of the State Engineer and Surveyor for 1903, Supplement, pages 71–74.

In 1854 a timber dam was built below lower Saranac lake for the purpose of flooding logs. In 1899–1901 a masonry dam and lock were erected by the State at this point, raising the water-level of lower Saranac lake, eighteen inches.

SARANAC RIVER NEAR PLATTSBURG, N. Y.

A gaging station was established by Robert E. Horton at the dam of the Plattsburg Light, Heat and Power Company, six miles above Plattsburg, March 17, 1903. This station is maintained by the U. S. Geological Survey in coöperation with this Department.

The record includes the flow over a straight spillway crest 171.25 feet in length, the discharge through two five-foot waste gates when open, and the discharge through five thirty-three-inch Victor turbines controlled by automatic governors. The gages were read and the record furnished by A. E. Hare until January, 1907; since then the record has been furnished by the company. Experiments were made at Cornell University hydraulic laboratory on a model of the ogee section of the dam, from which coefficients have been derived for the calculation of the discharge.[a]

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[a] Horton. "Weir experiments, coefficients and formulas."

Mean Daily Discharge, Second-feet, of Saranac River near Plattsburg, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	202	414	820	760	1,820	1,120	323	184	380	425	458	396
2	216	266	851	848	2,940	1,080	459	335	390	385	365	379
3	126	343	727	861	2,230	897	350	338	380	232	386	419
4	254	267	860	863	2,000	809	253	207	373	480	427	388
5	200	303	893	1,020	1,710	1,020	249	282	155	330	423	373
6	273	571	842	1,680	1,770	1,580	433	247	204	343	387	488
7	351	910	803	3,000	1,890	1,150	323	357	242	375	365	372
8	248	725	871	4,200	1,990	921	375	349	310	202	452	419
9	274	672	788	2,000	1,940	903	228	352	266	263	409	344
10	185	619	867	1,380	2,420	1,020	254	236	408	338	395	283
11	310	850	1,020	1,450	3,800	860	167	182	230	287	349	230
12	257	747	929	1,740	2,680	924	262	186	68	280	266	158
13	203	700	847	2,580	2,280	805	305	114	225	186	283	274
14	267	628	763	3,700	2,320	992	316	210	204	253	225	368
15	189	672	733	3,040	2,160	875	212	133	211	196	407	440
16	336	674	495	2,980	2,260	866	216	286	262	228	463	385
17	178	661	499	3,510	2,570	821	275	228	216	109	383	405
18	359	618	423	3,980	2,300	917	139	588	192	346	412	362
19	214	703	268	3,540	2,020	916	462	301	104	226	408	223
20	228	853	445	3,120	1,920	830	574	284	240	293	275	355
21	261	1,210	311	2,430	1,890	856	432	271	204	242	204	313
22	290	1,120	483	2,790	1,580	751	335	167	217	190	427	398
23	493	961	434	2,580	1,550	761	388	402	227	388	508	368
24	721	910	483	2,330	1,460	762	377	230	207	305	478	329
25	935	1,250	455	2,120	1,300	684	337	186	214	438	395	320
26	704	1,100	548	2,200	1,300	832	317	201	135	386	358	268
27	476	952	722	2,050	1,180	161	420	413	337	354	236	327
28	453	824	460	1,940	1,240	237	285	395	240	367	302	270
29	462	......	598	1,740	1,930	1,160	224	308	503	266	512	270
30	357	......	477	1,700	1,640	262	206	402	260	328	493	258
31	247	......	827	......	1,400	......	237	400	......	226	......	273

Monthly Discharge of Saranac River near Plattsburg, N. Y.

[Drainage area, 624 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909					
January	935	126	331	0.530	0.61
February	1,250	266	736	1.18	1.23
March	1,020	268	663	1.06	1.22
April	4,200	760	2,290	3.67	4.10
May	3,800	1,180	1,980	3.17	3.66
June	1,580	161	859	1.38	1.54
July	574	139	321	0.514	0.59
August	588	114	283	0.454	0.52
September	503	68	255	0.409	0.46
October	480	109	299	0.479	0.55
N	512	204	382	0.612	0.68
	488	158	336	0.538	0.62
	4,200	68	728	1.17	15.78

The following current-meter measurements were made in the tail-race in 1909, to determine leakage and to calibrate the water wheels.

Current-meter Discharge Measurements of Saranac Tail-race at Lozier Dam near Plattsburg, N. Y.

DATE.	Hydrographer.	Gage height.[a]	Width.	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Feet.*	*Square feet.*	*Feet per second.*	*Second-feet.*
July 15	Covert and Hoyt	2.10	59	161	2.13	343
Oct. 18	Covert and Hoyt	2.18	60	169	2.19	370
Oct. 18	Covert and Hoyt	2.18	60	174	1.93	336
Oct. 18	Covert and Hoyt	1.69	60	138	1.48	205
Oct. 18	Covert and Hoyt	2.065	60	165	2.06	341
Oct. 18	Covert and Hoyt	1.90	59	151	1.72	267

[a] Tail-race gage.

OSWEGATCHIE RIVER.

DESCRIPTION.

Oswegatchie river has its source in the region of lakes and timbered swamps in the southern part of St. Lawrence county. The largest of the lakes is Cranberry lake, which affords valuable storage to water-power users on its outlet, East branch of Oswegatchie river. East and west branches flow in a general northwesterly direction and unite near Talcville. From Gouverneur to Oxbow the river flows southwestward; it then turns sharply and flows northeastward to Rensselaer Falls, turns again to the northwest, receives the outlet of Black lake at Galilee, and finally enters the St. Lawrence at Ogdensburg.

OSWEGATCHIE RIVER NEAR OGDENSBURG, N. Y.

The gaging station was established May 16, 1903, by Robert E. Horton. It is located at Eel weir bridge, just below the junction of Oswegatchie river and Black lake outlet. This gaging station is maintained by the U. S. Geological Survey in coöperation with this Department.

The channel is in rock and is partly artifical, rock underneath the bridge having been removed by blasting to increase the bridge opening. The bridge consists of two spans, the right being 129.6 feet long and the left 130.1 feet.

Discharge measurements are made from the down-stream side of the bridge. The initial point for soundings is the top of the face of the right abutment, down-stream side.

A standard chain gage, which is observed twice daily by Joseph H. La Rue is attached to the ironwork of the bridge on the up-stream side of the right-hand span. The bench-mark is a square chisel draft on the up-stream side of the right-hand abutment; elevation, 16.72 feet above gage datum.

Mean Daily Gage Height, in Feet, of Oswegatchie River near Ogdensburg, N. Y.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	4.6	6.2	7.6	7.3	6.5	5.8	4.7	4.9	4.5	4.5	4.7	5.6
2	4.6	6.1	7.3	7.5	7.1	5.8	4.7	4.8	4.4	4.5	4.7	5.6
3	4.6	5.9	7.0	7.6	7.3	5.7	4.7	4.7	4.4	4.5	4.8	5.5
4	4.5	5.8	6.8	7.9	7.3	5.6	4.7	4.7	4.4	4.5	4.7	5.5
5	4.5	5.7	6.6	8.1	7.3	5.6	4.7	4.8	4.5	4.5	4.7	5.4
6	4.7	5.7	6.6	8.2	7.3	5.4	4.7	4.8	4.6	4.6	4.7	5.3
7	5.7	6.2	6.2	8.4	7.3	5.3	4.6	4.7	4.6	4.6	4.7	5.2
8	5.7	6.4	6.2	8.6	7.3	5.3	4.6	4.7	4.6	4.6	4.8	5.2
9	5.8	6.6	6.0	8.7	7.2	5.3	4.6	4.7	4.5	4.6	4.8	4.6
10	5.8	6.5	5.8	8.8	7.0	5.3	4.6	4.7	4.5	4.7	4.8	5.2
11	5.8	6.5	5.8	8.8	7.3	5.2	4.6	4.6	4.5	4.7	4.8	5.2
12	5.8	6.5	5.7	8.8	7.5	5.2	4.6	4.6	4.4	4.7	4.8	5.1
13	5.8	6.2	5.6	8.7	7.9	5.1	4.6	4.6	4.4	4.7	4.7	5.1
14	5.8	6.2	5.6	8.3	8.1	5.3	4.6	4.6	4.4	4.7	4.8	5.2
15	5.7	6.2	5.6	8.0	7.9	5.1	4.6	4.6	4.4	4.7	4.8	5.6
16	5.7	6.0	5.8	8.1	7.8	5.1	4.6	4.7	4.4	4.7	4.9	5.6
17	5.6	6.0	5.8	8.1	7.6	5.1	4.6	4.6	4.4	4.7	5.2	5.8
18	5.4	6.0	5.8	8.1	7.3	5.0	4.6	4.6	4.5	4.6	5.2	5.8
19	5.3	5.7	5.8	8.3	7.2	4.9	4.7	4.6	4.5	4.6	5.0	5.8
20	5.2	5.7	5.6	8.3	7.0	5.3	4.7	4.5	4.5	4.6	4.9	5.7
21	5.2	5.9	5.7	8.2	6.9	4.9	4.7	4.5	4.5	4.7	4.9	5.6
22	5.1	6.2	5.6	8.1	6.7	4.9	4.8	4.5	4.5	4.7	4.8	5.6
23	5.2	6.2	5.5	8.0	6.7	4.9	4.8	4.5	4.5	4.7	4.8	5.5
24	5.4	6.4	5.4	7.8	6.7	4.9	4.8	4.5	4.5	4.7	4.9	5.4
25	5.7	7.2	5.4	7.4	6.4	4.9	4.8	4.5	4.5	4.7	5.4	5.4
26	6.1	7.7	5.8	7.2	6.3	4.8	4.8	4.5	4.5	4.7	5.4	5.3
27	6.5	7.7	6.3	7.2	6.1	4.8	4.8	4.5	4.5	4.7	5.4	5.3
28	6.5	7.7	6.8	6.9	5.9	4.8	4.8	4.4	4.5	4.7	5.4	5.2
29	6.7	......	7.1	6.7	5.9	4.7	4.9	4.4	4.5	4.7	5.5	5.1
30	6.5	......	7.1	6.4	5.9	4.7	4.9	4.4	4.5	4.7	5.5	5.1
31	6.4	......	7.1	......	5.8	......	4.9	4.5	......	4.7	......	5.1

Rating Table for Oswegatchie River near Ogdensburg, N. Y.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
4.40	590	5.50	2,180	6.60	5,185	8.40	10,570
4.50	680	5.60	2,400	6.70	5,480	8.60	11,180
4.60	780	5.70	2,640	6.80	5,775	8.80	11,790
4.70	890	5.80	2,890	6.90	6,070	9.00	12,400
4.80	1,010	5.90	3,160	7.00	6,365	9.20	13,020
4.90	1,140	6.00	3,440	7.20	6,955	9.40	13,640
5.00	1,280	6.10	3,730	7.40	7,550	9.60	14,260
5.10	1,440	6.20	4,020	7.60	8,150	9.80	14,880
5.20	1,610	6.30	4,310	7.80	8,750	10.00	15,500
5.30	1,790	6.40	4,600	8.00	9,350	......	....
5.40	1,980	6.50	4,890	8.20	9,960	......	....

The above table is applicable only for open channel conditions. **It is based upon discharge measurements made during 1903 to 1908. It is fairly well defined.**

Mean Daily Discharge, Second-feet, of Oswegatchie River near Ogdensburg, N. Y.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	780	4,020	8,150	7,250	4,890	2,890	890	1,140	680	680	890	2,400
2	780	3,730	7,250	7,850	6,660	2,890	890	1,010	590	680	890	2,400
3	780	3,160	6,360	8,150	7,250	2,640	890	890	590	680	1,010	2,180
4	680	2,890	5,780	9,050	7,250	2,400	890	890	590	680	890	2,180
5	680	2,640	5,180	9,660	7,250	2,400	890	1,010	680	680	890	1,980
6	890	2,640	5,180	9,960	7,250	1,980	890	1,010	780	780	890	1,790
7	2,640	4,020	4,020	10,600	7,250	1,790	780	890	780	780	890	1,610
8	2,640	4,600	4,020	11,200	7,250	1,790	780	890	780	780	1,010	1,610
9	2,890	5,180	3,440	11,500	6,960	1,790	780	890	680	780	1,010	780
10	2,890	4,890	2,890	11,800	6,360	1,790	780	890	680	890	1,010	1,610
11	2,890	4,890	2,890	11,800	7,250	1,610	780	780	680	890	1,010	1,610
12	2,890	4,890	2,640	11,800	7,850	1,610	780	780	590	890	1,010	1,440
13	2,890	4,020	2,400	11,500	9,050	1,440	780	780	590	890	890	1,440
14	2,890	4,020	2,400	10,300	9,660	1,790	780	780	590	890	1,010	1,610
15	2,640	4,020	2,400	9,350	9,050	1,440	780	780	590	890	1,010	2,400
16	2,640	3,440	2,890	9,660	8,750	1,440	780	890	590	890	1,140	2,400
17	2,400	3,440	2,890	9,660	8,150	1,440	780	780	590	890	1,610	2,890
18	1,980	3,440	2,890	9,660	7,250	1,280	780	780	680	780	1,610	2,890
19	1,790	2,640	2,890	10,300	6,960	1,140	890	780	680	780	1,280	2,890
20	1,610	2,640	2,400	10,300	6,360	1,790	890	680	680	780	1,140	2,640
21	1,610	3,160	2,640	9,960	6,070	1,140	890	680	680	890	1,140	2,400
22	1,440	4,020	2,400	9,660	5,480	1,140	1,010	680	680	890	1,010	2,400
23	1,610	4,020	2,180	9,350	5,480	1,140	1,010	680	680	890	1,010	2,180
24	1,980	4,600	1,980	8,750	5,480	1,140	1,010	680	680	890	1,140	1,980
25	2,640	6,960	1,980	7,550	4,600	1,140	1,010	680	680	890	1,980	1,980
26	3,730	8,450	2,890	6,960	4,310	1,010	1,010	680	680	890	1,980	1,790
27	4,890	8,450	4,310	6,960	3,730	1,010	1,010	680	680	890	1,980	1,790
28	4,890	8,450	5,780	6,070	3,160	1,010	1,010	590	680	890	1,980	1,610
29	5,480	......	6,660	5,480	3,160	890	1,140	590	680	890	2,180	1,440
30	4,890	......	6,660	4,600	3,160	890	1,140	590	680	890	2,180	1,440
31	4,600	......	6,660	......	2,890	......	1,140	680	......	890	......	1,440

NOTE.— Daily discharge based on a fairly well defined rating curve.

Monthly Discharge of Oswegatchie River near Ogdensburg, N. Y.
[Drainage area, 1,580 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	5,480	680	2,520	1.59	1.83
February	8,450	2,640	4,400	2.78	2.90
March	8,150	1,980	3,970	2.51	2.89
April	11,800	4,600	9,220	5.84	6.52
May	9,660	2,890	6,330	4.01	4.62
June	2,890	890	1,600	1.01	1.13
July	1,140	780	899	.569	.66
August	1,140	590	791	.501	.58
September	780	590	663	.420	.47
October	890	680	831	.526	.61
November	2,180	890	1,260	.797	.89
December	2,890	780	1,970	1.25	1.44
The year	11,800	590	2,870	1.82	24.54

RAQUETTE RIVER.

DESCRIPTION.

Raquette river drains a long, narrow basin extending from northern Hamilton county to St. Lawrence river. Its sources are on an elevated plateau, dotted with mountains interspersed with lakes. The region is timbered, but numerous marsh and swamp areas exist, many of which are on the divide and feed streams flowing in opposite directions. The lakes of the head waters afford ample opportunities for storage development.

Observations at the dam of the Hannawa Falls Power Company were taken from September, 1902, to March 31, 1903. The discharge has not been computed.

The results of gagings at a station formerly maintained on Raquette river at South Colton, N. Y., may be found in the report of the State Engineer and Surveyor for 1904, pages 533–4.

RAQUETTE RIVER AT MASSENA SPRINGS, N. Y.

A gaging station was established by Robert E. Horton at the highway bridge at Massena Springs, September 21, 1903. Observations were continued until October 17, 1903, when the station was temporarily abandoned. It was resumed April 9, 1904, and has since been maintained by the U. S. Geological Survey in coöperation with this Department.

The channel is straight for 300 feet above and 1,000 feet below the bridge, which consists of a single span of 167.5 feet. The banks are not subject to overflow. The current is swift and uniform.

Discharge measurements are made from the down-stream side of the Massena Springs highway bridge. The initial point for soundings is the top of the right bridge abutment on the up-stream side of the bridge.

The gage, which was read during 1909 by Mrs. C. A. Wait, consists of a vertical scale attached to the right abutment on the up-stream side of the bridge. The bench-mark is a cross painted on the outside down-stream corner of the foundation adjacent to the sulphur springs; elevation above gage datum, 12.21 feet. The Sunday flow of this stream, like many others in this state, is often held back during the low-water season, while ponds at mills above are being refilled. Where there is extensive pondage of this character, the resultant effect may be shown in the stream for several days.

Mean Daily Gage Height, in Feet, of Raquette River at Massena Springs, N. Y.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	2.9	5.6	7.2	7.4	9.5	6.35	2.8	1.5	1.45	1.75	1.85	3.15
2	2.9	5.3	7.0	7.4	10.3	6.3	2.4	1.8	2.15	2.10	1.80	2.95
3	3.2	5.6	7.0	7.7	9.8	5.75	2.65	1.8	1.85	1.70	1.75	2.85
4	2.6	5.5	6.8	7.8	8.2	5.65	1.95	1.7	1.95	2.20	1.65	2.65
5	3.1	5.3	6.8	9.2	7.7	5.2	2.95	1.65	2.05	2.15	1.75	2.30
6	4.8	9.15	6.7	9.4	7.2	5.5	2.95	1.8	1.75	2.40	1.75	2.20
7	4.8	9.1	6.5	9.0	7.5	5.45	2.8	1.85	1.80	2.20	1.65	2.45
8	4.6	7.0	6.4	7.9	7.7	5.35	2.15	1.75	1.85	2.15	1.75	2.55
9	4.6	6.2	6.4	7.5	7.5	5.1	2.3	1.7	1.75	2.10	1.75	2.75
10	4.0	6.1	6.4	6.6	7.6	4.95	2.2	1.7	1.85	2.15	2.05	2.95
11	4.4	6.1	6.3	7.0	10.9	4.85	1.7	2.15	1.85	2.00	2.15	2.95
12	4.4	6.1	6.3	7.8	10.6	4.65	1.6	1.95	1.6	1.90	2.05	3.40
13	4.4	6.1	6.3	8.0	8.9	4.55	2.25	1.9	1.6	1.95	1.75	3.40
14	4.6	5.9	6.3	8.0	8.7	4.55	2.35	1.85	1.75	1.85	1.60	3.50
15	4.5	6.0	6.1	8.9	8.2	4.5	2.3	1.65	1.9	1.95	1.65	3.25
16	4.5	6.0	6.1	8.9	8.6	4.2	2.4	1.65	1.8	2.05	1.85	3.15
17	3.7	6.0	5.4	9.0	8.7	3.85	2.25	1.65	1.95	1.90	2.10	3.10
18	3.9	5.8	5.4	9.0	8.5	3.6	2.05	1.75	2.05	1.85	1.95	2.65
19	3.9	5.7	5.5	9.2	8.2	2.75	2.1	1.65	2.00	1.90	1.80	2.50
20	3.5	5.6	5.5	9.1	8.4	2.75	2.05	1.9	1.9	1.85	1.80	2.40
21	3.5	7.7	5.3	9.1	8.0	3.05	2.5	1.85	1.95	1.95	2.20	2.35
22	4.3	7.5	5.2	9.0	7.9	3.05	2.45	1.65	1.9	2.15	1.70	2.35
23	4.5	7.3	5.2	9.0	7.9	3.0	2.35	1.8	1.8	1.90	1.80	2.25
24	5.0	7.3	5.4	8.9	7.7	3.1	2.35	1.85	1.9	1.45	2.65	2.25
25	5.2	10.5	5.4	8.7	7.35	2.95	2.0	1.70	1.8	2.15	2.85	2.35
26	5.5	8.2	6.2	8.7	7.0	2.8	1.6	1.75	1.75	2.05	3.15	2.05
27	5.6	7.5	6.3	8.5	6.95	2.95	2.05	1.60	1.85	2.05	3.25	2.40
28	5.4	7.3	7.0	8.4	6.95	3.0	2.25	1.60	1.75	2.15	2.75	2.05
29	5.5	......	7.0	8.5	6.95	2.8	2.1	1.40	1.8	1.90	2.25	2.35
30	5.5	......	7.2	8.8	6.8	3.0	2.15	1.60	1.75	1.75	2.40	2.55
31	5.6	......	7.2	......	6.55	......	2.2	1.45	......	1.65	......	2.80

NOTE.— Gage heights affected by backwater from ice conditions, January 1 to about April 15 and about November 24 to December 31.

Current-meter Discharge Measurements of Raquette River at Massena Springs, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
		Feet.	*Feet.*	*Square feet.*	*Second-feet.*
1909.					
Feb. 14	C. R. Adams	5.55	168	709	a1,660
April 19	C. C. Covert	9.19	176	1,640	8,300
July 3	C. C. Covert	2.50	169	426	961

a Measurement made under partial ice cover. Average thickness of ice, 1.70 feet. Gage height to top of ice, 5.75. Ice varies in sections from .00 feet to 3.00 feet thick.

Rating Table for Raquette River at Massena Springs, N. Y., for 1908.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.70	105	3.10	1,345	5.50	3,500	7.80	6,320
0.80	130	3.20	1,420	5.60	3,600	7.90	6,460
0.90	155	3.30	1,500	5.70	3,710	8.00	6,600
1.00	185	3.40	1,580	5.80	3,820	8.20	6,740
1.10	215	3.50	1,660	5 90	3,930	8.40	6,880
1.20	250	3.60	1,740	6.00	4,040	8.60	7,020
1.30	285	3.70	1,825	6.10	4,150	8.80	7,160
1.40	325	3.80	1,910	6.20	4,260	9.00	7,300
1.50	365	3.90	1,995	6.30	4,370	9.20	7,450
1.60	405	4.00	2,080	6.40	4,490	9.40	7,600
1.70	450	4.10	2,170	6.50	4,610	9.60	7,750
1.80	500	4.20	2,260	6.60	4,730	9.80	7,900
1.90	550	4.30	2,350	6.70	4,850	10.00	8,050
2 00	605	4.40	2,440	6.80	4,970	10.20	8,200
2.10	660	4 50	2,530	6.90	5,100	10.40	8,350
2.20	720	4.60	2,620	7.00	5,230	10.60	8,500
2.30	780	4.70	2,710	7.10	5,360	10.80	8,650
2.40	845	4.80	2,800	7.20	5,490	11.00	8,800
2.50	910	4.90	2,900	7.30	5,620	11.20	8,960
2.60	980	5 00	3,000	7.40	5,760	11.40	9,120
2.70	1,050	5.10	3,100	7.50	5,900	11.60	9,280
2.80	1,120	5.20	3,200	7.60	6,040	11.80	9,440
2.90	1,195	5.30	3,300	7.70	6,180	12.00	9,600
3.00	1,270	5.40	3,400				

NOTE.—The above table is not applicable for ice or obstructed channel conditions. It is based on 23 discharge measurements made during 1903 -1908, and is well defined between gage heights 1.0 feet and 10.0 feet.

This rating differs materially from that published in the Fourth Annual Report of the New York State Water Supply Commission. Revision was made on the basis of new data available since the time of the publication of the earlier table.

Daily Discharge, Second-feet, of Raquette River at Massena Springs, N. Y.

DAY.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1909.								
1	......	8,800	4,430	1,120	365	345	475	525
2	......	10,100	4,360	845	500	690	660	500
3	......	9,280	3,760	1,020	500	525	475	475
4	......	6,880	3,660	578	450	578	720	428
5	......	6,180	3,200	1,230	428	632	690	475
6	......	5,490	3,500	1,230	500	475	845	475
7	......	5,900	3,450	1,120	525	500	720	428
8	......	6,180	3,350	690	475	525	690	475
9	......	5,900	3,100	780	450	475	660	475
10	......	6,040	2,950	720	450	525	690	632
11	......	11,000	2,850	450	690	525	605	690
12	......	10,600	2,660	405	578	405	550	632
13	......	7,900	2,580	750	550	405	578	475
14	......	7,600	2,580	812	525	475	525	405
15	......	6,880	2,530	780	428	550	578	428
16	7,900	7,450	2,260	845	428	500	632	525
17	8,050	7,600	1,950	750	428	578	550	660
18	8,050	7,300	1,740	632	475	632	525	578
19	8,350	6,880	1,080	660	428	605	550	500
20	8,200	7,160	1,080	632	550	550	525	500
21	8,200	6,600	1,310	910	525	578	578	720
22	8,050	6,460	1,310	878	428	550	690	450
23	8,050	6,460	1,270	812	500	500	550	500
24	7,900	6,180	1,340	812	525	550	345	550
25	7,600	5,690	1,230	605	450	500	690	550
26	7,600	5,230	1,120	405	475	475	632	550
27	7,300	5,160	1,230	632	405	525	632	550
28	7,160	5,160	1,270	750	405	475	690	550
29	7,300	5,160	1,120	660	325	500	550	550
30	7,750	4,970	1,270	690	405	475	475	550
31	......	4,670	......	720	345	......	428	....

NOTE.— Daily discharge based on a well-defined rating.

Monthly Discharge of Raquette River at Massena Springs, N. Y.
[Drainage area, 1,170 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minumum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	....	....	(850)	0.726	0.84
February	....	....	(1,800)	1.54	1.60
March	....	....	(1,700)	1.45	1.67
April	8,350	....	(5,170)	4.42	4.93
May	11,000	4,670	6,870	5.87	6.77
June	4,430	1,080	2,320	1.98	2.21
July	1,230	405	772	0.660	0.76
August	690	325	468	0.400	0.46
September	690	345	521	0.445	0.50
October	845	345	597	0.510	0.59
November	720	405	527	0.450	0.50
December	....	....	(550)	0.470	0.54
The year	11,000	325	1,850	1.58	21.37

NOTE.—Estimated, January to April 10, inclusive, and for December, based on gage heights and records at Piercefield.

LAKE ONTARIO DRAINAGE.

GENERAL FEATURES.

In the northwestern part of the state of New York, between Niagara and St. Lawrence rivers, is an area aggregating about 12,400 square miles drained by streams which flow into Lake Ontario. The divide which controls this drainage is very irregular. Extending to the south and southeast from Fort Niagara, it passes around the head waters of the Genesee a short distance into Pennsylvania; thence reëntering New York it runs southward and eastward from the interior group of lakes, turns to the north, encircles the sources of Black river, turns again to the west, and descends to the lake. The country thus included is level or gently undulating in the counties bordering the lake, but farther south it becomes more rolling, and a series of ridges, gradually increasing in height, stretch down between Cayuga and Seneca, and their companion lakes, finally becoming merged with the elevated broken country forming the principal divide, the abrupt slopes of which attain altitudes of from 2,000 to 2,500 feet about the head waters of the Genesee.

The easterly, or Black river lobe of the drainage basin receives the run-off from the southwestern slope of the Adirondack mountains — largely a rugged and forest-covered area — receiving heavy precipitation, especially in the winter.

Drift deposits are generally scattered over the section, and the soil is in part derived from that source and in part from the disintegration of native rocks.

The principal streams of the area are the Oswego, formed by the union of Seneca and Oneida rivers, which drain the chain of lakes in central New York, the Genesee, Salmon and Black rivers.

BLACK RIVER DRAINAGE BASIN.

BLACK RIVER.

DESCRIPTION.

Black river rises in the western part of Hamilton county, N. Y., flows southwestward across Herkimer county into Oneida county, turns near Forestport and runs somewhat west of north through Lewis county to eastern Jefferson county, and then flows westward to Black river bay, at the eastern extremity of Lake Ontario. The upper part of the basin is very rugged and mountainous and contains a large number of lakes.

The regimen of the river is controlled by storage on its upper tributaries, including Beaver river at Beaver, a series of reservoirs at the head waters of Moose river, and additional reservoirs at Forestport and on the head waters of the main river.

Water is diverted from Black river through Forestport feeder to supply the Black river canal at Boonville. A portion of this diverted water flows northward from Boonville and enters Black river again at Lyons Falls; the remainder flows southward through the Black river canal and enters the Erie canal at Rome.

The results of gagings of this division may be found in the State Engineer's Report for 1906, Supplement, page 36, and also on pages 597–598 of the report for 1907.

The results of gagings at a station formerly maintained on the Black river at Huntingtonville, N. Y., may be found in the report of the State Engineer and Surveyor for 1902, Supplement, pages 31–37.

BLACK RIVER NEAR FELTS MILLS, N. Y.

This station was established by Robert E. Horton, August 29, 1902, and has since been maintained by the U. S. Geological Survey in coöperation with this Department. It is located at the dam of the Harmon Paper Company, formerly owned by the Black River Traction Company, near the village of Felts Mills. The dam is nine miles up-stream from Watertown and seven miles up-stream from the old Huntingtonville gaging station on this stream. The drainage area is estimated at 1,851 square miles, or 37.5 square miles less than at Huntingtonville. The intervening area is mainly drained by two small streams, Townsend and Rutland Hollow creeks.

The dam is of sawed timber, rests on limestone foundation, and is very nearly water-tight. It has a slope on the up-stream face of 2.88 horizontal to 1 vertical. The crest is protected by boiler plate and the down-stream face is vertical, giving a free overfall. The main crest is 380.6 feet long. There are two additional sections on the right-hand side, one 14.1 feet long and the other 17.9

feet. A similarly constructed dam, 117 feet long, at the left bank serves as an auxiliary spillway and as a head-race wall.

The gage, which was read twice daily during 1909, at 7 A. M. and 6 P. M., is attached vertically to a crib at the left-hand side of the stream above the mill. Correction is made to the gage readings for velocity of approach during high water. The discharge over the spillways has been calculated by means of the weir formula, using coëfficients derived from experiments of the United States Geological Survey for a dam of similar cross-section.

A wood pulp mill has been constructed adjacent to this dam and was in operation during 1907. The mill contains four 72-inch and one 45-inch Smith-McCormick turbines. A record is kept of the hours run, and gate opening of each wheel, as well as of the head under which they operate.

The results obtained at this station in previous years may be found in the report of the State Engineer and Surveyor for 1906, Supplement, pages 36–40; 1907, page 381; 1908, page 425.

Mean Daily Discharge, Second-feet, of Black River near Felts Mills, N. Y.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.*a*
1909.												
1	1,493	2,688	6,806	5.080	8,926	2,942	1,097	*201	959	1,030	1,646	2,295
2	1,493	2,722	6,649	5,242	*10,204	2,214	1,081	2,113	921	959	966	2,253
3	*1,533	2,226	4,757	6,002	12,162	1,921	749	1,011	777	*754	1,251	2,048
4	2,558	2,228	4,151	*6,304	12,611	2,046	*384	908	836	1,365	1,511	1,922
5	2,722	2,228	2,991	7,989	12,772	1,893	634	868	*	1,094	1,450	*1,597
6	3,525	3,364	3,340	8,834	10,328	*2,693	1,612	868	769	1,557	1,131	2,128
7	4,488	*5,459	*2,085	12,214	8,884	3,820	1,406	817	1,075	896	*1,082	1,608
8	4,881	6,461	2,674	15,969	8,574	3,233	1,239	*713	1,276	996	1,622	2,009
9	4,518	6,448	2,471	16,998	*8,786	2,839	1,191	1,097	1,049	993	1,233	938
10	*3,856	7,001	2,829	16,684	10,751	2,839	905	1,087	1,075	*70	1,461	981
11	4,151	7,317	4,823	*13,575	11,917	2,420	*353	981	822	1,183	......	1,269
12	3,591	7,859	5,895	11,620	12,420	2,400	1,304	1,504	*201	848	......	*1,082
13	2,926	6,476	4,480	9,970	13,024	*2,151	1,716	855	1,268	966	......	2,098
14	2,516	*4,747	*3,448	12,414	11,963	2,330	1,337	1,438	906	933	*914	1,608
15	2,101	5,204	3,979	16,970	9,989	2,214	1,118	*1,209	848	843	1,685	1,969
16	1,442	4,410	4,469	23,058	*8,319	2,088	922	1,519	820	896	1,035	1,929
17	*1,473	4,113	2,705	19,107	7,933	1,837	2,561	1,571	864	*353	1,241	2,009
18	2,137	3,854	4,612	*16,626	7,175	1,637	*384	1,693	724	1,365	1,419	1,837
19	1,102	3,591	2,890	16,075	6,963	2,176	1,138	1,580	*754	1,368	1,810	*1,352
20	1,486	3,369	2,616	15,799	6,056	*3,139	867	1,010	897	1,307	1,589	2,244
21	1,776	*5,340	*2,019	14,957	5,621	2,695	1,249	862	897	1,330	*914	1,770
22	1,786	7,003	2,378	14,676	4,703	2,336	1,249	*714	820	1,580	2,621	1,849
23	2,064	7,120	2,462	13,303	*3,287	1,837	1,128	1,146	790	2,776	2,829	1,770
24	*4,596	7,949	2,504	12,503	4,229	1,796	1,091	942	779	*1,772	3,707	1,330
25	6,689	8,561	2,990	*11,463	3,591	1,601	*1,249	879	784	2,435	2,791	1,291
26	7,896	8,722	5,839	10,735	3,139	1,521	1,851	899	*714	1,570	2,504	*1,207
27	7,392	8,830	5,567	9,970	2,661	*1,888	1,677	1,054	1,253	1,407	2,233	1,886
28	6,879	*8,086	*4,312	8,242	2,906	1,935	1,438	*749	820	1,289	*1,713	1,639
29	5,699	......	5,443	8,015	2,910	1,204	1,158	714	825	1,340	3,253	1,639
30	5,481	......	4,757	8,270	*2,282	1,219	860	881	928	1,253	2,542	1,700
31	*3,476	......	4,596	......	2,997	......	1,080	811	......	*957	......	1,700
Mean	3,475	5,502	3,921	12,289	7,680	2,229	1,162	1,055	878	1,209	1,783	1,708

a Discharge affected by ice obstruction. * Indicates Sundays.

Monthly Discharge of Black River near Felts Mills, N. Y.
[Drainage area, 1,851 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minumum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	7,896	1,102	3,475	1.88	2.16
February	8,830	2,226	5,502	2.97	3.09
March	6,806	2,019	3,921	2.12	2.44
April	23,058	5,080	12,289	6.64	7.44
May	13,024	2,282	7,680	4.15	4.77
June	3,820	1,204	2,229	1.20	1.34
July	2,561	353	1,162	0.628	0.722
August	1,693	201	1,055	0.570	0.656
September	1,276	201	878	0.474	0.531
October	2,776	70	1,209	0.653	0.751
November	3,707	914	1,783	0.963	1.08
December	2,295	938	1,708	0.923	1.06

MOOSE RIVER.

DESCRIPTION.

Moose river is tributary to Black river at Lyons Falls, N. Y. Its drainage basin lies chiefly in Herkimer and Hamilton counties and comprises a wild, rugged, and uninhabited region, largely forest-covered, but containing also extensive tracts of cut and burned-over lands. The flow of the stream is more or less regulated by lumbermen's dams, the storage of which is utilized for floating logs.

MOOSE RIVER AT MOOSE RIVER, N. Y.

A gaging station was established June 5, 1900, at Moose River village by Robert E. Horton, and has since been maintained by the United States Geological Survey in coöperation with this Department.

The stream is smooth above the gaging station to the foot of McKeever dam, two miles up-stream, but a short distance above the gage it is divided by an island, which creates an ice jam during winter and spring freshets. A short distance below the station a fall occurs. The bed of the stream is of cobble with occasional boulders, the current is smooth, and the depth is fairly uniform. The stream freezes over in winter, alternate layers of ice and snow or slush often forming in such a manner as to prevent discharge measurements being made.

A cableway, having a clear span of 269 feet, was erected in June, 1903, from which current-meter measurements have since been made. The initial point for soundings is the left support of the cable.

The gage, which is read twice daily by Chris Hannon, consists of a graduated board scale, attached to posts on the left bank of the stream, and comprises a high-water and a low-water section. During the ice season the gage is read once each week. The gage was carried out by an ice freshet in February, 1903, and was replaced at a slightly different elevation. The bench-mark is on the top of a boulder on the left bank, 300 feet up-stream from the cable-way. Its elevation above the gage zero, prior to February 28, 1903, was 15.36 feet; after February 28, 1903, 15.53 feet.

Current-meter Discharge Measurements of Moose River at Moose River, N. Y.

DATE.	Hydrographer.	Width.	Area of action.	Gage height.	Discharge.
1909.		*Feet.*	*Square feet.*	*Feet.*	*Second-feet.*
Jan. 4[a]...	C. R. Adams........................	211	292	1.18	250
Feb. 12[b]..	C. R. Adams........................	216	882	3.19	1,090
July 6....	Covert and Hoyt....................	211	484	1.20	353
July 7....	Covert and Hoyt....................	212	442	1.02	291
Sept. 1[c]...	W. G. Hoyt	210	417	0.855	244

[a] Ice conditions; about 0.2 foot clear ice overlaid with 0.3 foot snow ice covered with slush.

[b] Nearly complete ice cover; average thickness of ice, 1.05 feet; gage height to top of ice, 3.29 feet.

[c] Made by wading at the cable section.

Mean Daily Discharge, Second-feet, of Moose River at Moose River, N. Y.

Day	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	158	576	1,150	387	3,430	496	193	195	278	360	175	405
2	208	536	974	238	4,330	432	193	195	265	405	195	330
3	74	536	780	168	3,560	402	262	175	265	405	205	278
4	248	496	755	188	2,590	357	417	175	240	450	240	240
5	248	496	730	228	2,590	342	342	290	240	482	240	240
6	357	705	705	312	2,020	606	252	252	240	420	240	228
7	1,120	1,060	705	2,270	3,430	720	278	265	240	321	240	215
8	805	1,240	576	3,300	4,780	646	215	420	240	265	302	195
9	417	1,450	576	3,300	3,510	586	215	265	240	290	302	150
10	476	1,310	656	1,710	5,870	514	240	265	215	315	302	180
11	417	1,150	805	2,030	6,190	670	228	240	195	290	290	200
12	387	1,090	780	1,620	4,330	745	228	240	195	290	290	220
13	387	1,000	705	1,840	3,180	586	215	240	195	265	265	190
14	357	884	705	6,110	2,590	532	240	215	175	265	265	190
15	312	855	656	6,670	1,800	479	240	215	175	240	265	210
16	258	805	616	4,560	3,060	586	215	195	195	265	240	210
17	268	805	616	4,400	3,300	606	185	215	195	265	215	220
18	297	914	576	5,390	2,220	795	128	215	195	265	240	230
19	327	855	596	5,000	1,580	1,110	360	195	195	265	265	250
20	297	1,240	656	6,510	1,460	850	405	195	215	278	278	250
21	268	2,380	616	4,65	1,280	670	360	195	215	290	265	250
22	312	2,430	616	3,900	1,020	566	315	175	240	265	360	230
23	372	2,100	616	3,970	877	532	315	175	240	265	482	230
24	456	1,720	656	3,300	906	417	302	155	265	228	590	230
25	2,050	1,600	656	2,820	850	312	360	155	265	215	610	210
26	2,230	1,480	705	2,650	770	300	420	175	252	215	570	210
27	1,720	1,340	755	2,700	695	193	390	175	252	215	518	210
28	1,310	1,240	914	2,700	626	288	315	195	265	185	500	190
29	884	......	680	2,540	566	288	252	195	302	175	500	190
30	596	......	536	2,270	532	288	215	185	315	175	465	210
31	576	......	496	......	532	......	215	185	......	90	......	230

NOTE.— Daily discharges January 1 to April 6 and December 9–31 were obtained from an ice curve based on two 1909 measurements and are only approximate. Daily discharges for the open water period are based on a well defined rating curve.

Monthly Discharge of Moose River at Moose River, N. Y.

[Drainage area, 346 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minumum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	2,230	74	587	1.70	1.96
February	2,430	496	1,150	3.32	3.46
March	1,150	496	696	2.01	2.32
April	6,670	168	2,920	8.44	9.42
May	6,190	532	2,400	6.94	8.00
June	1,110	193	530	1.53	1.71
July	420	128	275	0.795	0.92
August	420	155	214	0.618	0.71
September	315	175	233	0.673	0.75
October	482	90	281	0.812	0.94
November	610	175	330	0.954	1.06
December	405	150	226	0.653	0.75
The year	2,430	74	820	2.37	32.00

GENESEE RIVER DRAINAGE BASIN.

GENESEE RIVER.

DESCRIPTION.

Genesee river rises in Potter county, Pa., eight or ten miles south of the New York–Pennsylvania boundary, flows northwestward for about thirty-two miles by general course, then turns to the northeast and empties into Lake Ontario, seven miles north of Rochester. The entire length of the stream, following bends, is about 135 miles, and the drainage area is about 2,450 square miles.

In the northern counties the surface is rolling, with long, easy slopes, except along the streams, which usually lie in deep ravines, hemmed in by steep banks. On the whole there is a gradual rise away from the lakes, and in the upper half of the basin the country becomes rough and is broken by ridges, the summits of which attain elevations of from 2,000 to 2,500 feet above tide.

In the thirty-nine miles between Belmont, in central Allegany county, and Portage, in southwestern Livingston county, the fall of the water-surface is 253 feet, an average of 6.4 feet per mile. At Portage the river plunges down in three magnificent falls, and thence nearly to Mount Morris flows at the bottom of a deep gorge. From Mount Morris to Rochester the valley is broad and open and the stream is bordered by meadows subject to occasional overflow. At Rochester there is another abrupt descent over three heavy falls, amounting to about 260 feet within the city.

The series of remarkable lakes tributary to the Oswego basin is continued westward into the basin of the Genesee and includes Conesus, Hemlock, Canadice, and Honeoye lakes. These lakes serve as natural reservoirs and have inlets draining considerable areas at their upper ends. The slopes adjacent to the lakes themselves are narrow and steep and are drained by gulleys and torrential brooks. The area below the lakes is rolling and the soil is rich and extensively cultivated. The areas and elevations of these lakes are shown in the following table:

Areas and Elevations of Lakes in Genesee River Basin. a

LAKE.	Elevation.	Water-surface area.	Drainage area.	Per cent water-surface.
	Feet.	*Square miles.*	*Square miles.*	
Hemlock lake	896	2.8	46.8	6.12
Canadice lake	1,092	.7	12.6	5.57
Honeoye lake	800	2.5	39.6	6.41

a These lake basins are shown on the Honeoye, Canandaigua, Naples and Wayland topographic atlas sheets of the United States Geological Survey, from which the areas have been taken, with the exception of those for Hemlock and Canadice lakes, which are from surveys of Rochester water-works.

Above all the private dams at Rochester the State formerly maintained a dam for diverting water to the Erie canal, and in the basin of Black creek, one of the upper tributaries of the Genesee from the west, are two reservoirs (Rockville and Cuba reservoirs), owned by the State, also used for the benefit of the Erie canal.

Cuba reservoir, on the Genesee–Allegheny divide, receives the drainage from a tributary area of 26.6 square miles. The storage volume is 454,000,000 cubic feet. The overflow from this reservoir enters Allegheny river. The storage water may be turned into the summit level of the abandoned Genesee Valley canal and thence into Genesee river.

Drainage Areas of Tributaries of Genesee River. a

NAME OF STREAM.	AREA IN SQUARE MILES.		
	Tributary.	GENESEE RIVER.	
		Above tributary.	Below tributary.
Cryder creek	43.3	99.9	143.2
Chenunda creek	30.0	181.0	210.0
Dyke's creek	68.3	214.0	282.3
Vandermark creek	21.6	301.3	322.9
Knight's creek	22.3	323.9	346.2
Phillips creek	32.3	372.8	405.1
Vancampens creek	55.7	410.4	466.1
Angelica creek	82.1	481.1	563.2
White creek	15.9	569.2	585.1
Black creek	31.1	595.5	626.6
Crawford creek	11.8	637.6	649.4
Caneadea creek	63.3	651.0	714.3
Cold creek	41.0	745.3	786.3
Rush creek	35.3	787.0	822.3
Wiscoye:			
East Coy creek	59.9	....	....
West Coy creek	48.7	833.6	942.2
Wolf creek	19.3	974.9	994.2
Silver Lake outlet	30.4	1,029.2	1,059.6
Coshaqua creek	82.0	1,059.6	1,141.6
Canaseraga creek	258.7	1,148.4	1,407.1
Beards creek	41.3	1,423.1	1,464.4
Conesus Lake outlet	88.8	1,555.5	1,643.9
Honeoye creek	262.6	1,675.9	1,938.5
Allen's creek	198.1	1,947.1	2,145.2
Black creek	211.8	2,168.5	2,380.0
Genesee river, total at mouth	....	....	2,445.6

a From an early report on Genesee river storage.

Genesee River at Elmwood Avenue, Rochester, N. Y.

This station was established by Robert E. Horton, February 9, 1904, and was maintained by the United States Geological Survey in coöperation with this Department until May, 1907, when it was turned over to the Barge canal department. It is located at the Elmwood avenue bridge, in Rochester, N. Y.

The stream bed is of gravel and is clean and fairly permanent. The bridge consists of six spans of about 125 feet each. Conditions are favorable for the use of a current-meter. This gage is located above the State diverting dam, which causes, however, but little fluctuation in the level.

Discharge measurements are made from the down-stream side of Elmwood avenue bridge. The initial point for soundings is the top of the face of the left abutment, down-stream side. A standard cypress staff gage, which is read under the direction of E. A. Fisher, city engineer, is secured to the down-stream face of the first pier from the right-hand abutment of the bridge. The gage is sixteen feet long and is graduated decimally with galvanized-iron division marks.

Comparative Elevations.

	Rochester city datum.	Barge canal datum.
Zero, Elmwood avenue gage	245.591	506.848
Crest, Johnston and Seymour dam	241.91	503.16

Rating Table for Genesee River at Rochester, N. Y., for 1904–1909.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.00	400	3.70	5,080	6.40	12,600	9.10	21,760
1.10	490	3.80	5,320	6.50	12,900	9.20	22,120
1.20	580	3.90	5,560	6.60	13,220	9.30	22,480
1.30	670	4.00	5,800	6.70	13,540	9.40	22,840
1.40	760	4.10	6,060	6.80	13,860	9.50	23,200
1.50	850	4.20	6,320	6.90	14,180	9.60	23,580
1.60	1,000	4.30	6,580	7.00	14,500	9.70	23,960
1.70	1,150	4.40	6,840	7.10	14,820	9.80	24,340
1.80	1,300	4.50	7,100	7.20	15,140	9.90	24,720
1.90	1,450	4.60	7,380	7.30	15,460	10.00	25,100
2.00	1,600	4.70	7,660	7.40	15,780	10.10	25,480
2.10	1,780	4.80	7,940	7.50	16,100	10.20	25,860
2.20	1,960	4.90	8,220	7.60	16,440	10.30	26,240
2.30	2,140	5.00	8,500	7.70	16,780	10.40	26,620
2.40	2,320	5.10	8,780	7.80	17,120	10.50	27,000
2.50	2,500	5.20	9,060	7.90	17,460	10.60	27,400
2.60	2,700	5.30	9,340	8.00	17,800	10.70	27,800
2.70	2,900	5.40	9,620	8.10	18,160	10.80	28,200
2.80	3,100	5.50	9,900	8.20	18,520	10.90	28,600
2.90	3,300	5.60	10,200	8.30	18,880	11.00	29,000
3.00	3,500	5.70	10,500	8.40	19,240	11.10	29,400
3.10	3,610	5.80	10,800	8.50	19,600	11.20	29,800
3.20	3,940	5.90	11,100	8.60	19,960	11.30	30,200
3.30	4,160	6.00	11,400	8.70	20,320	11.40	30,600
3.40	4,380	6.10	11,700	8.80	20,680	11.50	31,000
3.50	4,600	6.20	12,000	8.90	21,040		
3.60	4,840	6.30	12,300	9.00	21,400		

The stream freezes over in winter at this Station. Measurements of discharge through ice have been made and a record of ice conditions is kept, but the data is insufficient for a satisfactory determination of discharge at certain times.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Genesee River at Elmwood Ave., Rochester, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909												
1	507.70	509.40	510.20	510.20	514.30	508.50	508.00	507.70	507.60	507.70	507.70	507.70
2	507.70	508.70	509.70	510.20	515.05	508.30	507.90	507.60	507.50	507.70	507.70	507.70
3	*a*	508.30	511.70	510.30	515.65	508.20	507.90	507.60	507.50	507.70	507.70	507.70
4	507.70	508.45	509.60	510.00	515.55	508.20	507.90	507.60	507.50	507.60	507.70	507.70
5	507.70	508.30	510.10	509.90	513.80	508.20	507.90	507.60	507.50	507.60	507.70	507.70
6	507.70	510.20	509.50	510.10	512.10	508.20	507.90	507.60	507.50	507.60	507.70	507.70
7	511.20	*a*	*a*	510.60	510.70	508.40	507.90	507.60	507.50	507.60	507.70	507.70
8	509.90	510.70	509.70	511.50	510.20	508.70	507.80	507.60	507.50	507.60	507.70	507.70
9	508.60	509.40	509.50	510.70	510.00	508.70	507.80	507.60	507.50	507.60	507.70	507.70
10	*a*	509.40	511.60	509.70	510.00	508.70	507.70	507.60	507.50	507.60	507.70	507.70
11	508.80	509.05	513.10	509.70	510.00	509.00	507.70	507.60	507.50	507.60	507.70	507.70
12	509.00	509.00	511.50	509.50	510.20	510.40	507.70	507.60	507.50	507.70	507.70	507.70
13	509.00	509.11	510.70	509.50	510.20	509.50	507.70	507.60	507.50	507.70	507.70	507.70
14	509.00	*a*	*a*	510.60	509.70	508.80	507.90	507.60	507.50	507.70	507.70	507.70
15	509.70	510.11	509.90	513.50	509.60	508.70	507.80	507.60	507.50	507.70	507.70	507.80
16	509.70	510.70	509.80	512.20	509.80	508.40	507.80	507.60	507.50	507.70	507.70	507.90
17	*a*	510.95	509.30	511.00	510.50	508.40	507.70	507.60	507.60	507.70	507.70	508.00
18	508.70	510.30	509.10	510.20	510.00	508.30	507.70	507.60	507.60	507.70	507.70	508.00
19	508.55	509.70	509.10	509.70	509.40	508.30	507.70	507.60	507.60	507.70	507.70	508.00
20	508.35	509.70	509.10	509.30	509.40	508.20	507.70	507.60	507.60	507.70	507.70	508.00
21	508.18	*a*	*a*	509.30	509.00	508.20	507.70	507.60	507.60	507.70	507.70	508.00
22	508.18	511.50	509.00	509.30	508.90	508.20	507.70	507.60	507.60	507.70	507.70	508.00
23	508.50	510.90	508.95	509.30	508.80	508.20	507.80	507.60	507.60	507.70	507.70	508.00
24	*a*	513.65	508.90	509.10	508.80	508.20	507.80	507.60	507.60	507.70	507.70	508.00
25	512.30	514.70	509.20	509.10	508.70	508.20	507.80	507.60	507.60	507.70	508.00	508.00
26	510.70	514.90	511.10	508.90	508.70	508.10	507.80	507.60	507.70	507.70	508.00	508.00
27	509.70	513.80	510.30	508.90	508.70	508.10	507.80	507.60	507.70	507.70	508.00	507.90
28	510.10	*a*	*a*	508.90	508.70	508.00	507.80	507.60	507.70	507.70	507.90	507.70
29	508.70	......	510.40	509.20	508.70	508.00	507.80	507.60	507.70	507.70	507.70	507.70
30	508.70	......	510.50	509.50	508.60	508.00	507.80	507.60	507.70	507.70	507.70	507.70
31	*a*	......	510.20	......	508.60	......	507.80	507.60	......	507.70	......	507.70

a No record, Sunday.

Current-meter Discharge Measurements of Genesee River at Rochester, N. Y

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Mean velocity.	Discharge.
		Feet.	*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
1909.						
Mar. 15	C. C. Covert	3.21	358	1,760	2.28	4,020
Apr. 21	C. C. Covert	2.82	360	1,620	2.35	3,810
May 11	A. R. Patchke	3.88	......	1,960	3.07	6,013

Mean Daily Discharge, Second-feet, of Genesee River at Elwood Ave., Rochester, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	400	2,900	4,600	4,600	16,440	1,300	670	400	355	400	400	400
2	400	1,600	3,500	4,600	19,060	1,000	580	355	310	400	400	400
3	......	1,000	8,500	4,840	21,220	850	580	355	310	400	400	400
4	400	1,225	3,300	4,160	20,860	850	580	355	310	355	400	400
5	400	1,000	4,160	3,940	14,820	850	580	355	310	355	400	400
6	400	4,600	3,100	4,380	9,620	850	580	355	310	355	400	400
7	7,100	......	......	5,560	5,800	1,150	580	355	310	355	400	400
8	3,940	5,800	3,500	7,940	4,600	1,600	490	355	310	355	400	400
9	1,450	2,900	3,100	5,800	4,160	1,600	490	355	310	355	400	400
10	......	2,900	8,220	3,500	4,160	1,600	400	355	310	355	400	400
11	1,780	2,230	12,600	3,500	4,160	2,140	400	355	310	355	400	400
12	2,140	2,140	7,940	3,100	4,600	5,080	400	355	310	400	400	400
13	2,140	2,320	5,800	3,100	4,600	3,100	400	355	310	400	400	400
14	2,140	......	......	5,560	3,500	1,780	580	355	310	400	400	400
15	3,500	4,380	3,940	13,860	3,300	1,600	490	355	310	400	400	490
16	3,500	5,800	3,300	9,900	3,720	1,150	490	355	310	400	400	580
17	......	6,450	2,700	6,580	5,320	1,150	400	355	355	400	400	670
18	1,600	4,840	2,320	4,600	4,160	1,000	400	355	355	400	400	670
19	1,375	3,500	2,320	3,500	2,900	1,000	400	355	355	400	400	670
20	1,075	3,500	2,320	2,700	2,900	850	400	355	355	400	400	670
21	850	......	......	2,700	2,140	850	400	355	355	400	400	670
22	850	7,940	2,140	2,700	1,960	850	400	355	355	400	400	670
23	1,300	6,320	2,050	2,700	1,780	850	490	355	355	400	400	670
24	......	14,350	1,960	2,320	1,780	850	490	355	355	400	490	670
25	10,200	17,800	2,500	2,320	1,600	850	490	355	355	400	670	670
26	5,800	18,520	6,840	1,960	1,600	760	490	355	400	400	670	670
27	3,500	14,820	4,840	1,960	1,600	760	490	355	400	400	670	580
28	4,380	......	......	1,960	1,600	670	490	355	400	400	580	400
29	1,600	......	5,080	2,500	1,600	670	490	355	400	400	400	400
30	1,600	......	5,320	3,100	1,450	670	490	355	400	400	400	400
31	......	......	4,600	......	1,450	......	490	355	......	400	......	400
Mean	2,455	5,785	4,465	4,331	5,757	1,276	487	356	340	388	436	502

Monthly Discharge of Genesee River at Elmwood Ave., Rochester, N. Y.
[Drainage area 2,365 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	10,200	400	2,455	1.04	1.20
February	18,520	1,000	5,785	2.44	2.54
March	12,600	1,960	4,465	1.89	2.17
April	13,860	1,960	4,331	1.83	2.05
May	21,220	1,450	5,757	2.44	2.81
June	5,080	670	1,276	0.540	0.605
July	670	400	487	0.206	0.237
August	400	355	356	0.151	0.174
September	400	310	340	0.144	0.161
October	400	355	388	0.164	0.189
November	670	400	436	0.184	0.206
December	670	400	502	0.212	0.244

GENESEE RIVER AT BALLINTINE BRIDGE, N. Y.

This gaging station was originally established at the West Shore railroad bridge crossing Genesee river, by the Barge Canal Department, March 21, 1905.

The gage was of the box-and-chain type, placed in a horizontal position and secured to the lower chord of the south truss at the center of the bridge. On May 10, 1907, during repairs to this bridge the gage was removed to the bridge crossing the mouth of Black Creek just above the West Shore bridge. On December 6, 1907, the gage was removed to its present location on the down-stream side of Ballintine bridge, which is located one-quarter mile up-stream from the West Shore bridge.

The datum of the gage has been maintained at elevation 506.00 since the establishment of the station. Current-meter measurements were formerly made at the West Shore railroad bridge, but were discontinued, owing to the proximity of this station to the Elmwood avenue gaging station in Rochester.

The drainage area at the West Shore railroad bridge is about 2,322 square miles, the principal tributaries intervening between the West Shore railroad bridge and the Elmwood avenue bridge being Little Black creek on the west, draining 19 square miles, and Red creek on the east, draining 24 square miles.

Black creek, which enters between the West Shore bridge and Ballintine bridge, drains 212 square miles, leaving a net drainage area at Ballintine bridge of about 2,110 square miles.

The gage is read at 9 A. M. each day by Martin Hunkley.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Genesee River at Ballintine Bridge, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	508.20	509.80	512.20	511.60	517.70	508.90	508.10	507.80	507.70	507.70	507.90	507.90
2	508.10	509.50	511.40	512.10	519.75	508.70	508.00	507.70	507.70	507.70	507.90	507.90
3	508.10	509.20	511.20	512.00	520.65	508.60	508.00	507.70	507.70	507.70	507.90	507.80
4	508.10	509.00	511.20	511.80	520.75	508.50	508.00	507.70	507.70	507.70	507.80	507.80
5	508.20	508.90	511.20	511.60	518.75	508.50	507.90	507.70	507.70	507.70	507.80	507.80
6	508.70	510.95	510.00	511.80	514.90	508.60	507.90	507.70	507.70	507.80	507.80	507.80
7	513.60	515.15	510.50	512.50	513.10	510.10	507.90	507.70	507.70	507.80	507.80	507.80
8	511.30	513.00	510.60	513.40	512.35	509.70	507.90	507.70	507.70	507.80	507.80	507.90
9	509.60	511.00	510.80	512.80	511.70	509.10	507.90	507.70	507.70	507.70	507.80	508.20
10	509.20	510.20	512.95	512.40	514.80	508.90	507.90	507.70	507.70	507.70	507.80	508.00
11	509.10	509.60	516.50	511.20	512.50	510.05	507.90	507.70	507.70	507.70	507.80	507.90
12	509.50	509.50	515.00	510.90	513.10	511.90	507.90	507.70	507.70	507.70	507.80	507.80
13	510.20	509.00	512.90	510.50	511.90	510.50	508.00	507.70	507.70	507.70	507.80	507.80
14	509.70	510.10	512.20	513.70	510.90	509.30	508.00	507.70	507.60	507.60	507.80	507.70
15	509.30	510.00	511.60	517.20	510.60	509.40	508.00	507.70	507.60	507.60	507.80	507.80
16	509.20	510.50	511.00	516.20	511.20	509.00	507.90	507.70	507.60	507.60	507.80	507.80
17	509.20	512.10	510.60	513.30	512.50	508.70	507.90	507.80	507.60	507.70	507.80	507.80
18	509.10	511.50	510.20	512.50	511.70	508.60	507.90	507.80	507.60	507.70	507.80	508.00
19	508.90	511.00	510.00	511.80	510.80	508.60	507.90	507.70	507.60	507.70	507.80	508.20
20	508.80	510.60	509.90	511.20	510.30	508.50	507.80	507.70	507.60	507.70	507.80	507.90
21	508.50	514.10	509.80	510.90	510.00	508.50	507.80	507.70	507.60	507.70	507.80	507.80
22	508.60	515.40	509.70	510.50	509.80	508.40	507.80	507.70	507.60	507.70	507.90	507.80
23	508.90	514.00	509.60	510.50	509.60	508.30	507.80	507.70	507.60	507.80	508.00	507.80
24	514.25	517.17	509.60	510.50	509.50	508.30	507.90	507.70	507.60	507.80	508.10	507.80
25	515.30	519.10	509.70	510.10	509.30	508.40	508.00	507.70	507.70	507.90	508.10	507.80
26	513.30	519.50	513.00	509.80	509.10	508.40	507.90	507.70	507.70	508.00	508.10	507.80
27	511.40	517.50	512.60	509.60	509.00	508.30	507.90	507.70	507.70	508.10	508.10	507.80
28	510.20	514.00	512.40	509.60	508.90	508.20	507.90	507.70	507.80	508.10	508.10	507.80
29	509.30	......	512.80	510.20	508.80	508.20	507.90	507.70	507.80	508.00	508.00	507.80
30	509.40	......	512.60	511.45	509.40	508.20	507.90	507.70	507.80	507.90	507.90	507.80
31	509.90	......	512.10	......	509.10	......	507.90	507.70	......	507.90	......	507.80

ERIE CANAL AT ROCHESTER, N. Y.

Current-meter Discharge Measurements of Flow in Erie Canal at Rochester, N. Y.

DATE.	Hydrographer.	ERIE CANAL.			
		WEST OF AQUEDUCT.		EAST OF AQUEDUCT.	
		Stage.[a]	Discharge.	Stage.[b]	Discharge.
		Feet.	*Second-feet.*	*Feet.*	*Second-feet.*
1909. May 17	A. R. Patchke................	4.95	[b]261	4.32	[c]319

[a] Below reference point.
[b] Measurement made at Plymouth Ave.
[c] Measurement made at Alexander St.

GENESEE RIVER AT MT. MORRIS, N. Y.

A gaging station has been established at the dam of the Mt. Morris Water Power Company, in the village of Mt. Morris, N. Y., and readings have been taken regularly twice each day, by John McAstocker, since September 1, 1905.

The station was established by Robert E. Horton, and is maintained by the United States Geological Survey in coöperation with this Department.

The dam is of masonry construction, having a horizontal crest of ogee cross-sections, 255.7 feet long. There are two wasteways, having crests each 12 inches wide and 18.0 feet and 17.9 feet long respectively, closed by stop-planks to about two feet above the main crest; also one short spillway with crest 6 inches wide and 17 feet long, and about one foot higher than the wasteways. The dam and the spillways are separated by masonry piers.

A portion of the flow is diverted through a section of the old Genesee Valley canal, which is utilized as a head-race, the power being used to drive a number of mills and factories. In order to determine the amount of this diversion, a gage has been placed in the tail-race below the mills, and it is read twice each day by F. M. Goff, electrical engineer in the employ of the Power Company. A number of meter measurements have been made and a rating curve to determine the daily flow through the canal is partly developed.

Mean Daily Discharge, Second-feet, of Genesee River at Mt. Morris, N. Y.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.
1909.								
1	368	584	1,740	2,660	18,800	612	250	118
2	371	640	1,650	3,190	15,100	479	224	172
3	346	674	2,600	2,400	6,930	479	212	172
4	422	767	2,230	2,120	4,770	467	197	340
5	1,950	909	1,520	2,480	3,640	562	262	191
6	6,500	5,370	1,360	3,400	2,670	2,000	201	178
7	2,510	4,220	1,480	4,750	2,130	1,160	196	166
8	1,000	1,680	1,590	3,210	1,710	849	195	82
9	836	1,460	1,650	2,140	1,470	659	206	152
10	853	1,370	7,680	1,980	1,580	647	213	142
11	923	1,040	5,810	1,620	2,570	4,430	165	142
12	844	794	2,790	1,780	1,880	2,000	224	142
13	501	1,110	2,590	1,970	1,430	1,210	201	142
14	541	869	2,120	10,100	1,210	946	166	122
15	758	1,560	1,710	5,640	1,200	1,210	178	82
16	724	1,560	1,580	3,630	2,040	843	184	154
17	559	1,420	1,260	4,730	1,630	777	190	148
18	657	1,130	1,110	2,030	1,260	594	105	160
19	642	1,180	1,160	1,710	1,150	659	190	148
20	609	4,390	1,150	1,480	960	536	184	154
21	705	4,900	918	1,360	913	443	184	136
22	659	3,300	946	1,490	823	455	197	82
23	4.700	5,430	889	1,550	777	419	190	148
24	7,740	13,400	903	1,200	752	600	190	136
25	4,880	10,800	1,820	1,050	640	428	87	142
26	2,290	4,300	6,760	946	602	377	204	154
27	1,650	3,130	1,880	966	546	337	190	154
28	1,210	2,300	2,290	1,270	519	288	190	154
29	767	......	2,310	1,590	1,130	268	184	82
30	650	......	2,060	13,700	853	212	184	154
31	672	......	1,730	......	764	......	172	154

NOTE.— 40 second-feet added for leakage through canal and waste-gate, January to May. Flash board on waste gate June to September cut leakage down to about six second-feet.

Monthly Discharge of Genesee River at Mt. Morris, N. Y.
[Drainage area 1,070 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	7,740	346	1,540	1.44	1.66
February	13,400	584	2,870	2.68	2.79
March	7,680	889	2,170	2.03	2.34
April	13,700	946	2,940	2.75	3.07
May	18,800	519	2,660	2.49	2.87
June	4,430	212	832	.778	.87
July	262	87	191	.179	.21
August	340	82	148	.138	.16

Current-meter Discharge Measurements of Genesee Tail-race at Mt. Morris, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
1909.		*Feet.*	*Feet.*	*Square feet.*	*Second-feet.*
April 21...	C. C. Covert	2.25	29	76	199
May 6...	E. F. Weeks	2.00	29	72	181
Aug. 14a..	C. C. Covert	.60	19	25	38
Aug. 15...	C. C. Covert	1.38	28	54	106
Aug. 16...	C. C. Covert	1.60	28	58	114

a Measurement made at wading section below bridge.

CANADICE LAKE.

DESCRIPTION.

Canadice lake is tributary to Genesee river through Hemlock lake outlet and Honeoye creek. The area drained by the lake forms an irregular rectangle, the lake lying somewhat to the left of the longitudinal axis and the greater portion of the drainage being on the eastern slope. The western slope is narrow and precipitous. Bald Hill rises from an altitude of 1,090 feet at the lake to 1,800 feet at the summit and has its axis parallel to the lake at an average distance of three-fourths of a mile from it. The lake has a water-surface area of 0.7 square mile and drains a total area of 12.6 square miles, 5.6 per cent of which is lake surface.

CANADICE LAKE OUTLET NEAR HEMLOCK, N. Y.

A weir was constructed at the outlet at the foot of the lake by the city engineer's department of Rochester, N. Y., in February, 1903. The entire yield of the drainage basin passes this wier.

A standard thin-edged weir, with a five-foot crest and two end contractions, is so arranged with needle-timbers at the ends that during high water the length may be increased to 14.96 feet with no end contractions. The weir crest stands three feet above the stream channel and is never submerged by backwater. There are two additional rectangle gates each one foot square, with three complete contractions and a fourth partial contraction at the bottom. The outflow from the lake above the weir is controlled by gates.

A reading of the depth of the weir is taken each morning, and also for each change of the gates, the depth being read to hundredths and corrections being made for velocity of approach for the larger discharges. The discharge is calculated by the Francis formula. The record has been furnished by E. A. Fisher, city engineer, and John F. Skinner, principal assistant city engineer, of Rochester, N. Y.

The record for 1909 is not yet available.

OSWEGO-ONEIDA-SENECA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Oswego river is formed by the union of Seneca and Oneida rivers at Three River Point about twelve miles northwest of Syracuse, N. Y., whence its course is northwestward to Oswego, where it enters Lake Ontario. The length of the river, from the junction to the mouth, is about 20.5 miles, and the drainage basin along this distance is a narrow strip of country, moderately rolling. Above the junction of Seneca and Oneida rivers the basin spreads out, attaining an extreme width east and west of about 100 miles and north and south of from seventy to eighty miles. There is, on the whole, a gradual rise from the low, level lands which border Lake Ontario to the north-south ridges which separate the various lakes south of Seneca river and which farther south become merged with the still more elevated country lying along the southern boundary of the Lake Ontario watershed.

The most remarkable feature of the drainage basin is the chain of lakes stretching across its southern border. From west to east the principal lakes are, in order, Canandaigua, Keuka, Seneca, Cayuga, Owasco, Skaneateles and Oneida. These seven lakes include a water-surface of, approximately, 280 square miles, increased by four smaller lakes — Cross, Onondaga, Otisco and Cazenovia — to about 295 square miles. The larger of the lakes, Oneida, Cayuga and Seneca, are used for steam-towing navigation, having connection with the Erie and Oswego canals. Cayuga and Seneca lakes are noted for their depth and for the abrupt slopes of their beds. The influence of the lakes on Oswego river is of the utmost importance in contributing to the steadiness of its flow.

A fall of 100 feet in the course of the main river is largely utilized by seven dams, which also partly canalize the stream. The intervening stretches are covered by the Oswego canal, which draws its water-supply from the river.

Drainage Areas Tributary to Oneida Lake and Oneida River. [a]

LOCALITY.	AREA IN SQUARE MILES.		
	Place to place.	Sub-total.	Total.
East branch, Fish creek.			
Head to junction with Alden creek	45.4		
Alder creek	25.7	71.1	
Junction with Alder creek to junction with Point Rock creek	36.7	107.8	
Point Rock creek	19.9	127.7	
Junction with Point Rock creek to junction with Fall brook	4.5	132.2	
Fall brook	13.5	145.7	
Junction with Fall brook to junction with Florence creek	1.3	147.0	
Florence creek	20.4	167.4	
Junction with Florence creek to junction with Furnace creek (Taberg)	1.7	169.1	
Furnace creek	14.4	183.5	
Taberg to junction with West branch, Fish creek	3.6	187.1	
West branch, Fish creek.			
Head to lower dam, Williamston	25.8	25.8	
Williamston to West Camden	27.1	52.9	
West Camden to junction with Mad river, Camden	14.2	67.1	
Mad river	45.4	112.5	
Camden to junction with Little river	21.6	134.1	
Little river	52.1	186.2	
Little river to McConnellsville	4.0	190.2	
McConnellsville to junction with East branch, Fish creek	11.9	202.1	
Junction of East and West branches, Fish creek, to junction with Wood creek	27.8	389.2	417.0
Wood creek.			
Above Erie canal, Rome	10.2	10.2	
Erie canal, Rome, to junction with Mud creek	2.0	12.2	
Mud creek	20.0	32.2	
Junction with Mud creek to junction with Canada creek	6.4	38.6	
Canada creek	31.0	69.6	
Junction with Canada creek to junction with Stoney creek	1.2	70.8	
Stoney creek	20.4	91.2	
Junction with Stoney creek to junction with Fish creek	31.4	122.6	122.6
Oneida creek.			
Head to Peterboro	13.4	13.4	
Peterboro to falls	6.7	20.1	
Falls to Munnsville	15.6	35.7	
Munnsville to Kenwood	27.3	63.0	
Kenwood to Oneida Castle (State dam)	10.8	73.8	
Oneida Castle to Sconondoa creek, Oneida	2.1	75.9	
Sconondoa creek	34.3	110.2	
Sconondoa creek to Durhamville	4.8	115.0	
Durhamville to mouth	28.0	143.0	143.0

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a From U. S. Geological Survey topographic maps.

Drainage Areas Tributary to Oneida Lake and Oneida River — (Concluded).

LOCALITY.	AREA IN SQUARE MILES.		
	Place to place.	Sub-total.	Total.
Canaseraga creek.			
Head of Perryville	5.7		
Perryville to Erie canal	9.0	14.7	
Erie canal to Douglas ditch	8.1	22.8	
Cowassalon creek.			
Head to Clockville creek	17.2	17.2	
Clockville creek	11.1	28.3	
Clockville creek to Erie canal	5.5	33.8	
Erie canal to mouth of Douglas ditch	39.3	73.1	
Junction with Douglas ditch to Lakeport	3.2	95.9	99.1
Chittenango creek.			
Erieville reservoir, water-surface	.45		
Erieville reservoir, land drainage	3.30	3.75	
Erieville reservoir to Cazenovia lake	30.5	34.25	
Cazenovia lake, water-surface	1.7	35.95	
Cazenovia lake, land drainage	8.7	44.65	
Cazenovia lake to Chittenango falls	14.4	59.05	
Chittenango falls to State dam, Chittenango	17.9	76.95	
State dam to junction with Butternut creek	28.1	105.05	
Butternut creek.			
Head of Jamesville reservoir	47.4	47.4	
Jamesville reservoir to State dam	5.7	53.1	
State dam to junction with Limestone creek	19.2	72.3	
Limestone creek.			
De Ruyter reservoir, water-surface	1.0		
De Ruyter reservoir, land drainage	17.8	18.8	
De Ruyter reservoir to junction with East branch	4.3	23.1	
East, or New Woodstock branch	12.6	35.7	
Junction with East branch to junction with West branch	34.5	70.2	
West branch, Limestone creek, enters above State feeder dam	24.8	95.0	
State dam to junction with Butternut creek.	18.2	113.2	185.5
Junction with Limestone creek to Chittenango creek.	1.1	186.6	291.65
Chittenango creek, junction with Butternut creek to Bridgeport	30.3	321.95	
Chittenango creek, Bridgeport to Oneida lake	4.3	326.25	326.25
Oneida lake drainage through main streams	....	1,107.95	
Big Bay creek	26.3		
Little Bay creek	11.5		
Scriba creek	45.4		
Coast drainage, north shore Oneida lake	54.5		
Coast drainage, south shore Oneida lake	28.9	166.6	1,274.55
Water-surface, Oneida lake	78		
Land drainage, Oneida lake	1,274.55	1,352.55	
Oneida river.			
Brewerton to Caughdenoy creek	4.8	4.8	1,357.9
Caughdenoy creek	19.3	24.1	1,376.7
Caughdenoy creek to Oak Orchard	25.1	49.2	1,401.8
Mud creek	34.7	83.9	1,436.5
Oak Orchard to Potts creek	5.0	88.9	1,441.5
Potts creek	22.9	111.8	1,464.4
Six Mile creek	24.0	135.8	1,488.4
Potts creek to Three River Point	4.5	140.3	1,492.9

Drainage Areas Tributary to Seneca River. [a]

LOCALITY.	AREA IN SQUARE MILES.			
	Place to place.	Sub-total.	Branch total.	General total.
Mud creek.				
Head to and including Schaffer creek	51.31			
Junction with Schaffer creek to junction with Sucker brook, Victor (formerly Ganargua creek)	25.70	77.01		
Sucker brook	20.15	97.16		
Ganargua creek.				
Victor to Erie canal, Macedon	26.20	123.36		
Macedon to junction with East Red creek, East Palmyra	55.0	178.36		
East Red creek	59.5	237.86		
East Red creek to Canandaigua outlet	61.37	299.23	299.23	
Canandaigua lake.				
Naples creek	48.55	171.97		
West river	42.08			
Other land drainage	81.34			
Water-surface	16.40	....	188.37	
Canandaigua outlet.				
Foot of lake to and including Black brook	50.37	238.74		
Black brook to Flint creek, at Phelps	54.34	293.08	293.08	
Flint creek.				
Above Patten	31.59			
Patten to Gorham, not including Gorham swamp	24.84	56.43		
Gorham swamp	5.46	61.89		
Gorham to Orleans	25.57	87.46		
Orleans to junction with Canandaigua outlet at Phelps	15.21	102.67	395.75	
Phelps to junction with Genargua creek at Lyons, forming Clyde river	48.36	444.11	743.34	
Clyde river.				
Lyons to junction with Seneca river, foot of Cayuga lake	141.11	884.45	....	884.45
Seneca river.				
Seneca lake.				
Keuka lake.				
Land drainage to outlet	160.96			
Water-surface	17.51	178.47		
Keuka outlet to Seneca lake	24.80	203.27	640.93	
Catharine creek.				
Above Montour Falls	66.46	....		
Montour Falls to Seneca lake	29.91	96.37		
Watkins Glen creek	23.53	23.53		
Direct lake drainage	317.76	317.76		
Water-surface	67.16	....	708.09	
Seneca river, foot of Seneca lake to Waterloo	40.90	....	748.99	
Seneca river, Waterloo to Seneca Falls	28.55	....	777.54	
Seneca river, Seneca Falls to Mud lock, foot of Cayuga Lake	7.52	....	785.06	
Cayuga lake.				
Cascadilla creek	14.38			
Six Mile creek	59.05			
Buttermilk creek	29.16			
Cayuga inlet	67.02			
Salmon creek	91.13			
Fall creek.				
Above Freeville	58.68			
Virgil creek	26.00	84.68		
Freeville to Cornell dam	30.62	115.20		
Cornell dam to Cayuga lake	1.56	116.76		
Taghanic creek.				
Above Halseyville	56.96			
Halseyville to Taghanic falls	10.40	67.36		
Taghanic falls to Cayuga lake	.39	67.75		
Other Cayuga lake drainage	275.04	720.29		
Cayuga lake, water-surface	66.31	786.60	1,571.60	

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[a] From U. S. Geological Survey topographic maps.

Drainage Areas Tributary to Seneca River — (Concluded).

LOCALITY.	AREA IN SQUARE MILES.			
	Place to place.	Sub-total.	Branch total.	General total.
Seneca river (*Concluded*).				
Seneca river, Cayuga lake, to junction with Clyde river	15.42	....	1,587.02	2,471.47
Seneca river, junction with Clyde river to junction with Owasco outlet	146.23	....	....	2,617.70
Owasco lake.				
Owasco inlet, above Moravia	74.33			
Moravia to Owasco lake	42.92	117.25		
Direct drainage to lake	76.24	193.49		
Foot of lake to State dam	.98	194.47		
Water-surface	10.40	204.87		
Owasco outlet to junction with Seneca river	16.73	221.66	....	2,839.30
Seneca river, junction with Owasco outlet to junction with Skaneateles outlet	98.70	....	....	2,938.00
Skaneateles lake.				
Land drainage to foot	58.41			
Water-surface	14.13	72.54		
Foot of lake to Willow Glen	1.84	74.38		
Willow Glen to Seneca river	16.69	91.07	....	3,029.07
Seneca river, Skaneateles outlet to Carpenter brook	25.50	....	....	3,054.57
Carpenter brook	18.70	....	....	3,073.27
Carpenter brook to Baldwinsville	48.10	....	....	3,121.37
Baldwinsville to Onondaga outlet	17.80	....	....	3,139.17
Onondaga lake.				
Otisco lake, land drainage to foot	41.40			
Otisco lake, water-surface	3.30	44.70		
Nine Mile creek (Otisco outlet) to Onondaga lake	74.0	118.70		
Onondaga creek.				
Above junction with West brook	40.6			
Junction with West brook to inflow to Onondaga lake	65.3	105.9		
Other land drainage to Onondaga lake.	59.1	283.7		
Onondaga lake, water-surface	4.7	288.4		
Onondaga lake, outlet to Seneca river	3.0	291.4	....	3,430.57
Seneca river, Onondaga outlet to Belgium	10.12	....	....	3,440.69
Seneca river, Belgium to Three River Pt	4.4	....	....	3,445.09

Drainage Areas Tributary to Oswego River. [a]

LOCALITY.	AREA IN SQUARE MILES.		
	Place to place.	Total from Three River Point.	Total drainage basin.
Oneida river, above Three River Point	....	....	1,493
Seneca river, above Three River Point	....	....	3,445
Oswego river at Three River Point	....	....	4,938
Three River Point to Phoenix	2.32	2.32	4,940.32
Phoenix to Hinmansville	17.58	19.90	4,957.90
Hinmansville to Ox creek	17.05	37.15	4,975.15
Ox creek	33.68	70.83	5,008.83
Ox creek to upper dam, Fulton	9.15	79.98	5,016.98
Fulton to Neatawanta creek	9.15	89.13	5,027.13
Neatawanta creek	21.92	111.05	5,049.05
Neatawanta creek to Black creek	1.01	112.06	5,050.06
Black creek	37.93	149.99	5,087.99
Black creek to Battle Island	.92	150.91	5,088.91
Battle Island to Minetto	2.11	153.02	5,091.02
Minetto to High dam	4.87	157.89	5,095.89
High dam to Oswego dam	1.22	159.11	5,097.11
Oswego dam to Lake Ontario	1.21	160.32	5,098.32

[a] From U. S. Geological Survey topographic maps.

GAGES ON OSWEGO RIVER.

The drainage directly tributary to Oswego river is 160 square miles. This area comprises chiefly moderately-rolling, cultivated upland, having a good depth of soil overlying the rock, which as a rule, is visible only in the bed of the stream. A portion of the area is drained through lakes and marshes. The run-off from the direct drainage to Oswego river is moderate and the regimen differs but little from that resulting from the inflow of the two main tributaries — the Oneida and Seneca.

Gages for Determining Elevation of Water-surface on Oswego River.

LOCATION.	DISTANCE IN MILES.[*]		Usual time of reading gage.	Present type of gage.
	From curved dam, Oswego.	Station to station.		
Above Oswego curved dam	0	0	8 a. m.	Board with coppered staples.
Below High dam	1.1	1.1	8 a. m.	Painted board scale.
Above High dam	1	1.2	8 a. m.	Reference point.
Below Minetto dam	2.3	3.5	6:30 a. m.	Chain and plumb-bob.
Above Minetto dam	.1	3.6	6:30 a. m.	Chain and plumb-bob.
Below Braddock dam[†]	3.2	6.8	9 a. m.	Chain and plumb-bob.
Above Braddock dam	.0	6.8	9 a. m.	Board with coppered staples.
Mouth of Waterhouse creek	2.3	9.1	9 a. m.	Reference point.
Manhattan Villa	.7	9.8	9 a. m.	Chain and plumb-bob. [a]
Above lower Fulton dam	.3	10.1	9 a. m.	Painted board.
Above Oswego Falls dam	.8	10.9	10 a. m.	Reference point.
Mouth of Ox creek	3.9	14.8	11 a. m.	Board with coppered staples.
Below Horsehoe dam	1.0	15.8	1 p. m.	Chain and plumb-bob.
Above Horseshoe dam	.2	16.0	1 p. m.	Chain and plumb-bob.
Hinmansville	.9	16.9	1 p. m.	Chain and plumb-bob.
Below Phoenix dam	3.0	19.8	Noon	Board with coppered staples.
Above Phoenix dam	.1	20.0	Noon	Board with coppered staples.

[*] Measured along course of stream on U. S. Geological Survey topographic map.
[†] Called also Battle Island dam.
[a] Discontinued.

OSWEGO RIVER ABOVE CURVED DAM, OSWEGO, N. Y.

A gage was erected above the State dam on Oswego river at Oswego, April 7, 1904, by this Department. The gage at present used is a ⅞-inch by 6-inch vertical board, graduated with coppered staples and brass figures, reading from zero to 9 feet. The elevation of the zero mark of the gage was 264.26 in 1906 and 264.23 in 1907–1909. The elevation of the crest of the curved dam is 264.9. Water is diverted to the Oswego canal and to the hydraulic power canals of the Oswego Canal Company at the right-hand end of the dam and to the Varick power canal at the left-hand side. The gage is attached to the down-stream side of the crib pier at the entrance to the Varick canal above the dam. It is read each morning by D. D. Tompkins.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River above Curved Dam, Oswego, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	267.33	268.13	269.93	269.83	269.53	268.63	267.53	267.93	267.63	267.73	267.73	267.23
2	265.73	268.23	269.83	269.93	270.03	268.53	267.23	266.33	267.23	267.73	268.03	267.03
3	266.83	268.13	269.73	269.93	269.83	268.53	267.23	266.83	267.43	267.73	268.03	267.53
4	265.93	268.13	269.73	269.93	269.93	268.33	267.63	266.33	267.13	267.23	268.13	267.23
5	267.38	268.13	269.63	269.83	269.83	268.43	267.63	267.63	267.73	267.73	268.13	267.73
6	267.73	268.53	269.43	269.73	269.83	268.63	267.03	267.53	267.33	267.83	268.13	266.83
7	267.73	269.03	269.63	269.73	269.83	268.43	267.03	267.03	267.23	267.83	268.13	266.73
8	267.83	268.73	269.43	269.63	269.83	268.43	266.93	267.93	267.53	267.83	268.03	267.63
9	267.43	268.73	269.33	269.63	270.13	268.43	266.83	266.53	266.73	267.83	267.93	267.23
10	267.73	268.53	269.13	269.63	269.93	268.43	266.63	266.93	267.23	268.13	267.83	266.43
11	267.53	268.53	269.23	269.93	269.93	268.43	268.03	266.93	267.63	267.73	267.93	266.23
12	267.53	268.43	269.43	269.63	269.93	268.33	267.83	266.93	267.73	268.23	267.93	268.03
13	267.43	268.63	269.43	269.73	269.93	268.53	267.83	267.23	265.33	268.13	268.03	265.83
14	267.63	268.73	269.53	269.83	269.93	268.33	267.73	266.83	267.23	268.03	267.83	266.73
15	267.63	268.63	269.43	270.03	269.93	268.23	267.63	267.73	267.63	267.93	267.83	267.63
16	267.73	268.33	269.43	270.03	270.03	268.13	267.63	266.83	267.53	267.93	267.83	267.43
17	267.73	268.33	269.33	270.13	269.83	268.13	267.33	266.83	267.73	267.93	267.83	267.23
18	267.33	268.43	269.13	270.33	269.73	268.03	267.13	267.23	267.23	267.23	267.73	266.93
19	267.33	268.43	269.23	270.03	269.63	267.93	266.33	267.33	267.73	267.93	267.63	268.33
20	267.38	268.63	269.13	269.93	269.53	268.23	266.73	267.03	265.53	268.03	267.23	266.53
21	267.33	269.23	269.13	269.93	269.53	268.03	266.33	267.33	267.23	268.03	267.83	267.23
22	267.33	269.23	269.03	269.93	269.43	267.93	267.73	267.63	267.63	268.23	266.13	267.33
23	267.73	269.33	268.83	269.73	269.53	267.93	267.73	267.63	267.63	267.83	267.63	267.23
24	268.38	269.83	268.93	269.73	269.23	267.83	267.13	267.73	267.73	267.93	266.93	267.53
25	268.53	270.03	269.33	269.93	269.03	267.83	267.73	267.63	267.63	267.73	267.93	268.03
26	268.63	270.23	269.73	269.73	268.93	267.73	267.33	267.63	267.73	268.03	267.23	267.73
27	268.53	270.13	269.73	269.53	268.83	267.93	267.23	267.63	266.63	268.03	267.23	267.03
28	268.53	270.13	269.83	269.53	268.83	267.63	267.13	267.53	267.63	267.93	268.03	267.63
29	268.33	......	269.93	269.33	268.63	267.53	266.83	267.93	267.63	267.93	266.73	267.63
30	268.13	......	269.93	269.33	268.93	267.53	267.63	265.63	267.23	267.73	267.73	267.53
31	268.53	......	269.83	......	269.03	......	267.53	267.53	......	267.73	......	267.53

Oswego River below High Dam near Oswego, N. Y.

High dam is the second dam above the mouth of the Oswego river and is located 1.1 miles above the curved dam. A gage was erected below this dam, April 7, 1904. The gage is a vertical board divided to feet and tenths by means of coppered staples with brass figures. It is attached to the left-hand face of a stone-filled timber crib, forming down-stream extension of the masonry abutment at the left-hand end of the dam. The zero mark on the gage is at elevation 266.07.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River below Hig Dam near Oswego, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
190).												
1	267.27	269.27	270.82	270.77	270.57	269.67	268.27	268.27	267.97	268.07	268.17	267.67
2	267.05	269.37	270.87	270.87	270.77	269.57	268.17	268.57	267.77	267.97	268.27	267.77
3	267.22	269.27	270.87	270.87	270.97	269.47	268.17	268.27	267.87	268.27	268.27	268.07
4	266.82	269.37	270.87	270.67	270.97	269.37	267.97	268.77	267.37	266.52	268.37	267.97
5	267.99	269.37	270.82	270.77	270.87	269.47	268.27	267.97	268.27	268.17	268.37	268.37
6	268.52	269.57	270.57	270.77	270.87	269.37	267.97	267.87	267.77	268.17	268.37	267.27
7	268.07	269.77	270.57	270.67	270.97	269.47	267.87	267.37	267.77	268.27	268.27	267.47
8	268.67	269.77	270.47	270.67	269.97	269.47	267.77	266.95	267.87	268.17	268.17	268.27
9	268.07	269.57	270.27	270.67	270.87	269.37	267.72	266.79	267.67	268.17	268.07	267.87
10	268.57	269.37	270.27	270.77	271.07	269.32	267.57	267.37	266.97	268.27	268.07	267.17
11	268.27	269.47	270.47	270.77	271.07	269.47	268.47	267.27	267.97	267.87	268.17	267.67
12	268.27	269.42	270.47	270.77	271.07	269.27	268.47	266.97	268.17	268.47	268.27	268.37
13	268.17	269.57	270.57	270.67	271.02	269.27	268.47	267.67	267.15	268.47	268.17	266.57
14	268.37	269.52	270.57	271.07	270.97	269.37	268.37	267.07	267.87	268.37	268.17	268.27
15	268.47	269.42	270.57	271.17	270.87	269.17	268.17	267.17	267.97	268.27	267.67	268.07
16	268.47	269.17	270.57	271.22	270.77	269.07	268.12	266.37	267.87	268.27	268.17	268.07
17	268.37	269.27	270.37	271.37	270.87	269.07	268.07	267.27	267.97	268.37	268.37	268.07
18	268.42	269.37	270.07	271.07	270.77	269.07	268.27	267.67	267.67	267.27	268.07	267.97
19	268.37	269.37	270.17	271.27	270.67	268.97	267.77	267.77	268.17	268.47	268.07	268.47
20	268.42	269.57	270.07	271.17	270.57	268.97	267.87	267.47	267.22	268.27	267.77	267.37
21	268.42	269.77	269.97	271.07	270.47	268.97	268.07	267.67	267.57	268.27	268.17	268.27
22	268.37	270.07	269.97	271.07	270.37	268.87	267.97	267.97	267.97	268.47	266.77	268.27
23	268.42	270.22	269.87	270.97	270.17	268.87	267.97	266.97	268.07	268.17	268.17	268.27
24	269.02	270.57	269.87	270.87	270.27	268.77	267.67	268.17	268.07	268.27	268.17	268.17
25	269.37	271.07	270.27	270.77	270.07	268.77	268.37	267.97	268.07	267.67	268.37	268.27
26	269.37	270.97	270.87	270.67	269.97	268.77	267.77	267.97	268.27	268.17	267.77	267.67
27	269.32	271.07	270.77	270.57	269.87	268.77	267.67	267.77	267.07	268.35	267.87	267.87
28	269.37	271.07	270.87	270.57	269.87	268.97	267.47	267.87	268.07	268.27	268.47	268.47
29	269.07	......	270.87	270.37	269.77	268.57	267.37	268.17	267.97	268.07	267.17	268.37
30	269.07	.....	270.97	270.47	269.67	268.47	267.97	267.03	267.67	268.17	268.27	268.47
31	269.07	......	270.87	......	269.87	......	268.17	267.77	......	268.37	......	268.47

OSWEGO RIVER ABOVE HIGH DAM NEAR OSWEGO, N. Y.

A record of the stage of the water above High dam has been kept since April 1, 1907. An effort was formerly made to determine the discharge from observations at this point, but owing to the undetermined leakage, this has been found impracticable. A description of the conditions may be found in Supplement to the Report of the State Engineer and Surveyor of New York for 1902, pages 91–96. Water is diverted to the Oswego canal on the right-hand bank, and for the power plants of the Oswego Water Works & Electric Light Company on the left-hand bank. Flashboards were formerly maintained on the crest of the dam in the summer season. In 1903 the crest was permanently raised by masonry. The elevation of water surface is determined by measuring downward with a graduated rod from a reference point on the up-stream end of the left-hand abutment. The gages at High dam were read each morning by Samuel L. Purdy, to January 31, 1909, and by Arthur C. Owens after that date.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River above High Dam near Oswego, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	282.97	284.07	286.52	286.47	286.27	285.12	283.67	282.47	282.17	282.57	282.57	282.87
2	282.25	284.27	286.47	286.47	286.37	285.07	283.57	282.37	282.17	282.47	282.57	282.97
3	282.77	284.02	286.47	286.47	286.67	284.97	283.57	282.47	282.17	282.47	282.67	283.07
4	282.57	284.07	286.42	286.27	286.57	284.87	283.27	281.97	282.17	281.57	282.77	282.97
5	283.07	284.17	286.37	286.47	286.52	284.97	283.42	282.27	282.07	283.47	282.67	282.77
6	283.57	284.57	286.12	286.37	286.47	284.77	283.37	282.17	281.47	282.57	282.77	282.72
7	282.67	284.77	286.02	286.37	286.57	285.07	283.27	282.17	282.27	282.67	282.57	282.97
8	283.22	284.87	286.02	286.27	286.57	284.97	283.22	280.72	282.17	282.57	282.67	283.07
9	283.17	284.67	285.92	286.27	286.37	284.87	283.17	281.85	282.07	282.57	282.87	282.87
10	283.17	284.57	285.92	286.42	286.67	284.92	283.17	282.27	281.87	282.47	282.87	282.87
11	283.32	284.62	286.02	286.22	286.57	284.97	282.97	282.27	282.27	281.47	282.87	282.67
12	283.37	284.47	286.12	286.47	286.67	284.87	283.17	282.27	282.07	282.67	282.87	282.67
13	283.27	284.77	286.12	286.37	286.62	284.67	283.17	282.27	282.07	282.57	282.97	282.47
14	283.37	284.47	285.97	286.62	286.57	284.82	283.07	281.27	282.17	282.47	282.97	283.07
15	283.47	284.52	286.12	286.77	286.47	284.67	283.02	281.97	282.17	282.47	282.77	283.07
16	283.37	284.22	286.07	286.82	286.37	284.57	282.97	281.57	282.27	282.42	282.87	283.07
17	283.22	284.27	285.97	286.87	286.37	284.57	282.87	282.37	282.37	282.57	282.97	282.97
18	283.17	284.37	285.67	286.67	286.37	284.47	282.52	282.37	282.17	281.87	282.87	282.87
19	283.37	284.37	285.82	286.82	286.32	284.37	282.82	282.17	282.17	282.57	282.97	282.87
20	283.42	284.67	285.67	286.72	286.22	284.32	282.87	282.27	281.62	282.47	282.87	282.47
21	283.42	284.87	285.37	286.67	286.17	284.42	282.37	282.27	282.47	282.47	282.77	283.07
22	283.47	285.32	285.52	286.62	286.07	284.32	282.67	282.12	282.37	282.67	282.67	282.87
23	283.47	285.52	285.42	286.52	285.77	284.27	282.67	282.07	282.37	282.37	282.97	282.97
24	283.97	286.12	285.42	286.42	285.87	284.17	282.57	282.27	282.47	282.27	282.97	282.97
25	284.57	286.57	285.82	286.17	285.67	284.17	282.77	282.27	282.47	282.37	282.97	283.07
26	284.57	286.37	286.37	286.32	285.57	284.12	282.67	282.37	282.37	282.57	282.87	282.67
27	284.62	286.62	286.37	286.17	285.47	283.77	282.67	282.27	281.07	282.67	282.97	282.87
28	284.47	286.47	286.27	286.07	285.42	284.32	282.47	282.27	282.57	282.67	282.87	282.97
29	284.22	......	286.47	285.92	285.37	283.87	282.52	282.07	282.57	282.47	282.67	282.97
30	284.27	......	286.47	286.12	285.07	283.82	282.52	281.34	282.57	282.57	282.97	282.97
31	283.42	......	286.42	......	285.27	......	283.17	282.17	......	282.67	......	282.87

OSWEGO RIVER BELOW DAM AT MINETTO, N. Y.

The dam at Minetto is located 3.5 miles up-stream from Oswego. A gage was erected by this Department, April 18, 1904, for the purpose of determining the water-elevation below the dam. During the year 1907 a weight-and-chain gage was used, the box and scale being attached horizontally to the coping of the river wall at the right-hand end of the dam. The standard datum for this gage is at elevation 286.61, the chain length being 16.00. The gage is read each morning by Roy L. Smith.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River below Dam at Minetto, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	289.91	291.61	293.71	294.21	293.51	292.71	291.01	288.51	288 81	289.31	289.31	239.71
2	289.91	291.61	293.61	294.21	293.61	292.71	290.81	288.61	288.81	289.31	289.21	289.71
3	289.51	291.71	293.61	294.21	293.71	292.71	290.61	288.61	288.91	289.21	289.11	289.71
4	289.71	291.81	293.51	294.11	293.81	292.61	290.51	288.51	288.91	289.31	289.01	289.71
5	289.81	291.91	293.41	294.21	293.91	292.61	290.61	288.51	288.81	289.21	289.01	289.61
6	289.91	292.11	293.31	294.21	293.91	292.51	290.51	288.41	288.91	289.11	289.01	289.71
7	290.11	292.01	293.21	294.11	294.01	292.61	290.41	288.41	288.91	289.01	288.91	289.71
8	290.21	292.11	293.41	294.11	294.11	292.51	290.31	288.21	289.01	289.01	289.01	289.71
9	290.31	292.11	293.41	294.11	294.11	292.51	290.21	288.61	289.01	289.01	289.11	289.81
10	290.11	292.01	293.51	294.11	294.21	292.51	290.21	288.61	289.11	288.91	289.21	289.81
11	290.31	292.01	293.51	294.01	294.11	292.41	290.11	288.71	289.11	289.01	289.31	289.81
12	290.31	292.01	293.51	294.11	294.01	292.41	290.21	288.81	289.01	289.01	289.41	289.71
13	290.21	292.01	293.41	294.11	294.01	292.31	290.11	288.91	289.11	289.01	289.51	289.81
14	290.31	291.81	293.31	294.21	294.01	292.41	290.01	289.01	289.01	288.91	289.41	289.81
15	290.31	292.01	293.41	294.31	294.01	292.31	289.91	289.11	289.01	288.91	289.51	289.71
16	290.31	292.11	293.41	294.41	293.91	292.21	289.71	289.31	288.91	288.91	289.51	289.71
17	290.21	292.11	293.31	294.51	293.91	292.11	289.51	289.21	288.91	288.81	289.61	289.71
18	290.41	292.21	293.31	294.51	293.81	292.01	289.21	289.11	288.91	288.91	289.61	289.71
19	290.41	292.41	293.21	294.51	293.71	291.91	289.31	289.01	288.81	288.91	289.71	289.61
20	290.41	292.51	293.11	294.41	293.61	291.61	289.31	288.91	288.91	288.91	289.71	289.61
21	290.51	292.51	292.91	294.31	293.51	291.71	289.31	288.81	288.91	288.91	289.61	289.71
22	290.91	292.71	293.11	294.21	293.51	291.61	289.31	288.71	289.01	288.91	289.81	289.81
23	291.11	293.11	293.11	294.11	293.41	291.51	289.41	288.91	289.01	288.91	289.81	289.81
24	291.31	293.61	293.11	294.01	293.41	291.41	289.41	288.91	289.11	288.81	289.81	289.81
25	292.11	293.71	293.21	293.81	293.31	291.31	289.31	288.81	289.11	289.01	289.71	289.81
26	292.01	293.71	293.41	293.91	293.21	291.31	289.31	288.81	289.01	289.01	289.71	289.71
27	291.91	293.81	293.91	293.91	293.11	291.21	289.21	288.81	289.11	289.11	289.71	289.81
28	291.81	293.91	293.91	293.81	293.01	291.31	289.11	288.81	289.11	289.11	289.61	289.81
29	291.71	293.81	294.01	293.81	292.91	291.21	289.01	288.61	289.21	289.21	289.71	289.81
30	291.61	......	294.01	293.51	292.71	291.11	288.81	288.81	289.21	289.31	289.71	......
31	291.41	......	294.11	......	292.81	......	288.61	288.81	......	289.21	......	......

Oswego River above Dam at Minetto, N. Y.

The gage used since 1907 has been of the weight-and-chain type, the box containing the gage scale being attached horizontally to the coping of the right-hand abutment, a few feet up-stream from the crest of the dam. The standard datum for this gage is 295.18, the chain length being 9.1 feet. The gage was established April 18, 1904, and is read each morning by Roy L. Smith. Water is diverted to the Oswego canal at the right-hand side and to the Minetto Shade Cloth Company's race at the left-hand side of the stream.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River above Dam at Minetto, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	299.08	*a*	301.58	301.58	301.28	300.68	299.48	298.18	299.48	299.68	299.88	299.98
2	299.08	*a*	301.48	301.58	301.18	300.58	299.38	298.28	299.48	299.78	299.78	299.98
3	298.88	*a*	301.38	301.58	301.28	300.58	299.38	298.18	299.48	299.78	299.68	299.98
4	299.08	*a*	301.28	301.48	301.28	300.48	299.28	298.18	299.48	299.88	299.58	299.88
5	299.08	300.38	301.28	301.58	301.38	300.48	299.38	298.18	299.38	299.88	299.58	*a*
6	*a*	300.58	301.18	301.58	301.48	300.38	299.28	298.18	299.48	299.78	299.58	*a*
7	*a*	300.58	300.98	301.48	301.48	300.48	299.18	298.18	299.48	299.78	299.48	*a*
8	*a*	300.58	301.18	301.48	301.58	300.48	299.08	298.08	299.58	299.68	299.58	*a*
9	*a*	*a*	301.28	301.48	301.58	300.48	298.98	299.38	299.58	299.58	299.68	*a*
10	*a*	*a*	301.28	301.48	301.68	300.38	298.88	299.48	299.68	299.48	299.68	*a*
11	*a*	*a*	301.28	301.38	301.58	300.38	298.78	299.48	299.68	299.58	299.78	*a*
12	*a*	*a*	301.28	301.48	301.58	300.38	298.88	299.48	299.58	299.58	299.88	*a*
13	*a*	*a*	301.28	301.48	301.48	300.28	298.78	299.58	299.68	299.58	299.88	*a*
14	*a*	*a*	301.18	301.58	301.38	300.38	298.68	299.68	299.68	299.48	299.78	*a*
15	*a*	*a*	301.28	301.58	301.28	300.38	298.58	299.58	299.68	299.48	299.88	*a*
16	*a*	*a*	301.18	301.68	301.18	300.28	298.48	299.68	299.58	299.48	299.88	*a*
17	*a*	*a*	301.08	301.68	301.18	300.18	298.38	299.58	299.58	299.38	299.88	*a*
18	*a*	*a*	300.98	301.68	301.18	300.08	298.28	299.58	299.58	299.48	299.98	*a*
19	*a*	*a*	300.88	301.68	301.18	299.98	298.38	299.48	299.48	299.48	299.98	*a*
20	*a*	*a*	300.78	301.58	301.18	299.88	298.38	299.48	299.58	299.48	299.98	*a*
21	*a*	300.98	300.68	301.58	301.08	299.98	298.38	299.48	299.58	299.48	299.88	*a*
22	*a*	300.98	300.88	301.58	301.08	299.98	298.38	299.38	299.58	299.48	300.08	*a*
23	*a*	301.08	300.88	301.48	300.98	299.88	298.48	299.48	299.68	299.48	300.08	*a*
24	*a*	301.38	300.88	301.38	301.08	299.88	298.48	299.48	299.68	299.38	300.08	*a*
25	300.48	301.38	300.98	301.28	300.98	299.78	298.38	299.48	299.68	299.58	299.98	*a*
26	300.48	301.48	301.18	301.38	300.98	299.78	298.48	299.38	299.58	299.68	299.98	*a*
27	300.38	301.58	301.48	301.48	300.88	299.68	298.48	299.38	299.68	299.68	299.9[illegible]	*a*
28	300.38	301.48	301.38	301.48	300.78	299.78	298.38	299.38	299.68	299.78	299.88	*a*
29	300.38	......	301.48	301.38	300.68	299.68	298.38	299.28	299.68	299.78	299.98	*a*
30	*a*	......	301.48	301.28	300.58	299.58	298.28	299.38	299.68	299.88	299.98	*a*
31	*a*	......	301.58	......	300.68	......	298.28	299.48	......	299.78	......	*a*

a No record on account of ice.

OSWEGO RIVER OPPOSITE BATTLE ISLAND.

A gage was established September 14, 1900, on the Oswego river opposite Battle Island. This station was maintained by the United States Geological Survey in coöperation with this Department. The results may be found in the Supplement of the Report of the State Engineer and Surveyor of New York for 1902, pages 86–91; for 1903, pages 41–42, and for 1904, pages 512–513. The gage readings were discontinued in 1905. On May 25, 1907, a gage was erected by this Department on the right-hand bank of the Oswego river opposite Battle Island and directly across the stream from the former gage. Readings of this gage have been taken by Smith Sharp. The zero of the gage is at elevation 294.42. The new gage consists of a vertical board, graduated to feet and tenths.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River opposite Battle Island.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	300.22	303.22	306.42	305.85	305.62	303.32	301.27	299.42	299.92	300.32	300.02	300.62
2	299.72	303.22	306.42	305.82	305.77	302.97	301.17	299.57	300.12	300.22	300.17	300.72
3	299.22	303.32	306.22	305.87	306.17	302.84	300.76	299.52	300.07	300.12	300.32	300.77
4	299.72	303.32	306.12	305.82	306.17	302.52	300.42	299.47	300.05	299.92	300.47	300.72
5	300.42	302.92	306.12	306.02	306.06	302.66	300.65	299.62	299.82	300.14	300.52	300.22
6	301.12	303.12	305.72	305.95	306.12	303.22	300.52	299.42	300.07	300.32	300.57	300.72
7	300.52	303.42	305.47	306.04	306.16	303.47	300.82	299.47	300.06	300.27	300.32	300.82
8	301.82	303.92	305.23	305.84	306.17	303.42	300.94	300.42	300.02	300.16	300.82	300.72
9	301.42	303.72	305.04	305.97	305.95	303.47	300.42	300.22	299.97	300.07	300.62	300.74
10	300.52	303.32	305.25	305.52	306.12	303.34	300.52	300.04	299.96	299.82	300.82	300.52
11	301.32	303.12	305.38	305.94	306.27	303.05	299.62	299.85	300.02	299.52	300.72	300.32
12	301.32	303.32	304.47	305.97	306.32	302.47	301.22	299.62	299.82	300.12	300.62	300.42
13	301.52	303.42	305.83	306.37	306.26	303.12	301.22	300.02	299.94	300.32	300.52	300.52
14	301.52	303.02	305.34	307.05	306.24	303.27	300.74	300.02	300.07	300.06	300.22	300.92
15	301.62	303.62	305.36	307.14	306.07	302.97	300.56	299.52	299.97	300.03	300.62	301.32
16	301.42	303.52	305.24	306.87	305.87	302.94	300.47	299.82	300.02	300.02	300.82	301.22
17	300.62	303.52	304.87	306.12	306.12	302.82	300.07	300.32	300.17	299.92	300.87	300.92
18	301.62	303.52	304.76	306.63	305.85	302.65	299.42	300.42	300.04	300.12	300.87	300.62
19	301.92	303.62	304.27	306.35	305.84	302.52	299.62	300.22	299.82	300.17	300.67	300.92
20	301.82	303.62	304.72	306.24	305.66	302.42	300.02	299.87	300.04	300.22	300.52	301.24
21	301.52	303.62	304.22	306.32	305.37	302.52	299.42	299.82	300.00	300.22	300.32	301.22
22	301.42	304.32	304.24	306.16	305.27	302.57	299.62	299.52	300.07	300.52	300.32	301.12
23	301.42	304.52	305.12	306.12	304.73	302.47	299.52	299.82	300.17	299.92	300.52	301.05
24	302.12	305.52	305.92	305.82	304.97	302.42	299.67	300.02	300.27	299.62	300.62	301.06
25	303.22	306.22	305.77	305.54	304.87	301.47	299.42	300.22	300.27	300.22	300.72	301.05
26	303.22	306.42	306.12	305.72	304.62	302.06	299.57	299.47	299.82	300.32	300.62	300.82
27	302.12	306.42	305.77	305.47	304.42	301.72	299.42	300.12	299.47	300.37	300.52	300.72
28	302.02	306.42	305.54	305.85	304.27	301.92	299.52	300.05	300.02	300.22	300.22	301.32
29	301.92	......	306.26	305.27	304.14	301.73	299.52	299.62	300.17	300.12	300.62	301.34
30	302.92	......	306.12	305.37	303.72	301.42	299.52	299.82	300.22	300.17	300.67	301.32
31	302.72	......	305.47	......	303.97	......	299.57	299.97	......	299.92	......	301.36

Mean Daily Discharge, Second-feet, of Oswego River opposite Battle Island.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	2,800	7,495	14,252	13,022	12,480	7,690	4,145	2,000	2,470	2,910	2,580	3,270
2	2,280	7,495	14,252	12,915	12,808	7,008	4,000	2,135	2,670	2,800	2,745	3,400
3	1,830	7,690	13,804	13,022	13,692	6,818	3,565	2,090	2,635	2,690	2,910	3,565
4	2,280	7,690	13,580	12,915	13,692	6,170	3,020	2,045	2,635	2,470	3,080	3,400
5	3,020	6,910	13,580	13,355	13,467	6,448	3,335	2,180	2,380	2,690	3,140	2,800
6	3,930	7,300	12,700	13,242	13,580	7,495	3,140	2,000	2,635	2,910	3,205	3,400
7	3,140	7,890	12,150	13,355	13,692	7,990	3,530	2,045	2,635	2,855	2,910	3,530
8	4,980	8,890	11,605	12,915	13,692	7,890	3,725	3,020	2,580	2,745	3,530	3,400
9	4,360	8,490	11,170	13,242	13,242	7,990	3,020	2,800	2,525	2,635	3,270	3,466
10	3,140	7,690	11,712	12,260	13,580	7,790	3,140	2,580	2,525	2,380	3,530	3,140
11	4,220	7,300	11,930	13,130	13,916	7,203	2,180	2,425	2,580	2,090	3,400	2,910
12	4,220	7,690	10,018	13,242	14,028	6,083	4,070	2,180	2,380	2,690	3,270	3,020
13	4,510	7,890	12,915	14,140	13,916	7,300	4,070	2,580	2,470	2,910	3,140	3,140
14	4,510	7,105	11,820	15,732	13,916	7,593	3,400	2,580	2,635	2,635	2,800	3,660
15	4,660	8,290	11,930	15,850	13,467	7,008	3,205	2,090	2,525	2,580	3,270	4,220
16	4,360	8,090	11,605	15,260	13,022	7,008	3,080	2,380	2,580	2,580	3,530	4,220
17	3,270	8,090	10,848	13,580	13,580	6,725	2,635	2,910	2,745	2,470	3,595	3,790
18	4,660	8,090	10,642	14,700	13,022	6,448	2,000	3,020	2,580	2,690	3,595	3,660
19	5,130	8,290	9,608	14,140	13,022	6,170	2,180	2,800	2,380	2,745	3,335	3,660
20	4,980	8,290	10,540	13,804	12,590	5,995	2,580	2,425	2,580	2,800	3,140	4,100
21	4,510	8,290	9,505	14,028	11,930	6,170	2,000	2,380	2,580	2,800	2,910	4,070
22	4,360	9,710	9,505	13,692	11,712	6,262	2,180	2,090	2,635	3,140	2,910	3,930
23	4,360	10,120	11,390	13,580	10,540	6,083	2,090	2,380	2,745	2,470	3,140	3,832
24	5,470	12,260	13,130	12,915	11,060	5,995	2,230	2,580	2,855	2,180	3,270	3,846
25	7,495	13,804	12,808	12,260	10,848	4,435	2,000	2,800	2,855	2,800	3,400	3,832
26	7,495	14,252	13,580	12,700	10,330	5,385	2,135	2,045	2,380	2,910	3,270	3,530
27	5,470	14,252	12,808	12,150	9,915	4,820	2,000	2,690	2,045	2,965	3,140	3,400
28	5,300	14,252	12,260	13,022	9,608	5,130	2,090	2,635	2,580	2,800	2,800	4,220
29	5,130	......	13,916	11,712	9,403	4,820	2,090	2,180	2,745	2,690	3,270	4,248
30	6,910	......	13,580	11,930	8,490	4,360	2,090	2,380	2,800	2,745	3,335	4,220
31	6,510	......	12,150	......	8,992	......	2,135	2,525	......	2,470	......	4,276
Mean	4,494	9,057	12,106	13,394	12,298	6,476	2,808	2,418	2,580	2,685	3,181	3,650

NOTE.— Considerable ice obstruction, January 1 to 27; estimated flow probably excessive some obstruction during remainder of winter.

Monthly Discharge of Oswego River opposite Battle Island.
[Drainage area, 4,900 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	7,495	1,830	4,494	0.917	1.05
February	14,252	6,910	9,057	1.85	1.92
March	14,252	9,505	12,106	2.47	2.84
April	15,850	11,712	13,394	2.73	3.06
May	14,028	8,490	12,298	2.51	2.89
June	7,990	4,360	6,476	1.32	1.48
July	4,145	2,000	2,808	0.573	0.659
August	3,020	2,000	2,418	0.493	0.567
September	2,855	2,045	2,580	0.527	0.590
October	3,140	2,090	2,685	0.548	0.630
November	3,595	2,580	3,181	0.649	0.727
December	4,276	2,800	3,650	0.745	0.857

OSWEGO RIVER BELOW BATTLE ISLAND DAM.

A chain-and-weight gage was erected on the down-stream end of the right-hand abutment of the Battle Island, or Braddock's dam, April 11, 1904, by H. U. Lyon, of this Department. The gage reads decimally from zero to 9 feet, the standard elevation of the water-surface, when the gage reads zero, being 301.00, and the chain length being 11.78 feet. The gage is read each morning by Smith Sharp.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River below Battle Island Dam.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	303.20	303.80	306.70	306.25	305.95	304.60	303.90	302.65	302.80	304.10	303.10	303.40
2	303.20	304.20	306.30	306.20	306.00	304.60	303.95	303.50	302.80	304.10	303.10	303.45
3	302.60	304.20	306.30	306.22	306.60	304.50	303.90	303.45	302.80	302.70	303.10	303.50
4	303.10	304.10	306.20	305.90	306.45	304.50	303.50	302.70	302.70	302.50	303.10	303.45
5	303.50	304.00	306.00	306.40	306.30	304.50	303.90	303.15	302.05	303.00	303.55	303.05
6	303.80	304.30	305.80	306.20	306.35	304.25	303.90	303.05	303.00	302.90	303.25	303.55
7	303.60	304.20	305.57	306.20	306.50	304.70	303.85	303.05	302.75	303.00	302.60	303.50
8	303.40	304.50	305.55	306.00	306.45	304.55	303.70	302.65	302.75	302.50	303.20	303.50
9	303.50	304.40	305.53	306.20	306.15	304.60	303.60	303.20	302.80	302.75	303.05	303.40
10	303.20	304.30	305.53	306.30	306.75	304.60	303.55	303.05	302.90	302.65	303.25	303.30
11	303.50	304.30	305.53	305.80	306.60	304.60	303.20	302.90	302.75	302.85	303.30	303.00
12	303.60	304.30	305.70	306.50	306.60	304.60	303.85	302.80	302.25	302.75	303.40	302.90
13	303.60	304.40	305.70	306.15	306.60	304.30	303.60	302.80	303.25	303.00	303.30	303.60
14	303.50	304.10	305.40	306.50	306.50	304.55	303.55	302.90	302.90	302.75	302.90	303.35
15	303.50	304.30	306.00	306.80	306.30	304.45	303.40	301.70	302.80	302.50	303.40	303.45
16	303.50	304.00	305.60	306.90	306.10	304.30	303.50	303.20	302.75	302.50	303.30	303.45
71	303.10	304.20	305.60	306.90	306.55	304.30	303.35	303.10	302.70	302.70	303.50	303.25
18	303.50	304.20	305.55	306.50	306.25	304.20	302.70	303.20	302.80	303.10	303.40	303.30
19	303.60	304.10	305.40	306.90	306.05	304.10	303.50	302.80	302.55	303.00	303.30	303.40
20	303.50	304.30	305.25	306.75	305.95	304.05	303.35	302.70	304.90	303.00	303.20	303.20
21	303.50	304.30	304.80	306.50	305.80	304.45	303.05	303.00	302.80	302.70	302.90	303.35
22	303.50	305.10	305.25	306.60	305.70	304.15	303.30	302.65	302.85	303.20	303.45	303.30
23	303.50	305.10	304.90	306.40	305.20	304.15	303.35	302.90	302.80	302.50	303.30	303.30
24	303.90	305.90	304.90	306.35	305.60	304.15	303.40	302.90	302.90	302.55	303.25	303.40
25	304.50	306.00	305.50	305.70	305.30	304.10	303.00	302.80	302.90	303.15	303.20	303.45
26	304.30	306.50	306.00	306.25	305.10	304.00	303.25	302.80	302.55	303.05	303.35	303.40
27	304.30	306.60	306.00	305.80	305.50	303.90	303.25	302.80	303.20	303.00	303.30	303.30
28	304.30	306.30	305.75	305.70	305.00	304.10	303.20	302.85	302.85	302.85	303.10	303.60
29	304.10	......	306.55	305.55	304.80	303.95	303.20	302.65	303.10	302.80	303.50	303.60
30	304.10	......	306.35	305.95	304.50	303.90	303.15	303.20	303.50	302.80	303.35	303.65
31	303.80	......	306.25	......	304.90	......	303.15	302.90	......	302.55	......	303.45

OSWEGO RIVER ABOVE BATTLE ISLAND DAM.

This gage is attached to the up-stream vertical face of the right-hand abutment of the dam. It was established April 11, 1904, by H. U. Lyon, and readings are taken each morning by Smith Sharp. The gage consists of a vertical board, subdivided to feet and tenths by coppered staples, and reads from zero to 9 feet. Water is diverted to supply the Oswego canal at the right-hand side of the stream and to the raceway of a large wood pulp mill at the left-hand side. The elevation of the zero mark of the crest gage is 306.14. The crest of the dam is at elevation about 305.00.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River above Battle Island Dam.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	309.90	310.30	312.00	311.75	311.60	310.85	310.00	308.90	309.00	308.10	309.00	309.30
2	309.40	310.20	311.80	311.72	311.70	310.80	310.49	309.60	309.00	308.10	309.10	309.30
3	309.00	310.10	311.80	311.70	312.00	310.75	309.90	309.55	308.90	308.90	309.15	309.35
4	309.30	310.10	311.70	311.60	311.95	310.70	309.60	308.95	308.90	308.85	309.20	309.30
5	309.40	310.10	311.60	311.85	311.70	310.75	309.90	309.30	308.70	309.20	309.20	309.05
6	309.80	310.60	311.40	311.70	311.95	310.25	309.90	309.20	309.10	309.10	309.15	309.40
7	309.50	310.40	311.45	311.70	311.95	310.90	309.85	309.20	309.05	309.15	308.90	309.45
8	309.60	310.70	311.40	311.60	311.95	310.80	309.70	308.90	308.90	308.90	309.10	309.30
9	309.60	310.60	311.37	311.70	311.70	310.75	309.70	309.20	308.95	309.05	309.15	309.25
10	309.40	310.40	311.41	311.80	312.00	310.80	309.55	309.20	309.00	308.95	309.10	309.20
11	309.70	310.50	311.41	311.60	311.90	310.80	309.30	309.00	309.10	309.10	309.25	309.10
12	309.80	310.40	311.50	311.90	311.95	310.80	309.90	309.00	308.80	309.10	309.25	309.10
13	309.80	310.60	311.50	311.15	311.90	310.05	309.70	309.00	309.45	309.15	309.20	309.40
14	309.80	310.20	311.35	311.95	311.75	310.80	309.60	309.20	309.20	308.70	309.00	309.25
15	309.80	310.60	311.62	312.00	311.65	310.70	309.50	308.20	309.00	308.90	309.30	309.30
16	309.80	310.30	311.60	312.10	311.70	310.60	309.40	309.20	309.00	308.90	309.20	309.30
17	309.20	310.30	311.50	312.15	311.90	310.60	309.40	309.10	308.90	308.95	309.35	309.20
18	309.70	310.20	311.60	312.50	311.70	310.60	309.00	309.20	009.00	309.20	309.20	309.20
19	309.80	310.20	311.25	312.50	311.65	310.40	309.60	309.00	308.90	309.10	309.30	309.15
20	309.70	310.50	311.15	312.00	311.60	310.30	309.35	308.90	309.30	309.10	309.25	309.20
21	309.60	310.50	311.00	311.90	311.60	310.50	309.25	309.05	309.10	309.00	309.15	309.20
22	309.70	311.00	311.20	311.90	311.55	310.35	309.80	308.90	309.15	309.15	309.20	309.20
23	309.70	311.10	311.02	311.85	311.35	310.40	309.55	309.10	309.05	308.90	309.30	309.20
24	310.00	311.10	311.00	311.80	311.45	310.40	309.50	309.10	309.10	308.80	309.25	309.30
25	310.70	311.80	311.00	311.50	311.25	310.30	309.10	309.00	309.10	309.15	309.30	309.35
26	310.50	311.90	311.60	311.60	311.10	310.20	309.35	309.00	308.90	309.15	309.25	309.30
27	310.50	311.90	311.60	311.60	311.05	310.00	309.30	309.00	309.20	309.05	309.20	309.30
28	310.50	311.80	311.60	311.45	310.95	310.25	309.30	309.05	309.00	309.00	309.10	309.30
29	310.20	......	311.85	311.45	311.00	310.25	309.30	308.90	309.10	309.00	309.30	309.30
30	310.10	......	311.75	311.60	310.80	310.00	309.25	308.30	309.00	309.00	309.30	309.35
31	310.00	......	311.80	......	311.00	......	309.25	308.00	......	308.70	......	309.30

OSWEGO RIVER AT MOUTH OF WATERHOUSE CREEK, FULTON, N. Y.

Waterhouse creek, sometimes incorrectly called Black creek, enters the Oswego river in the north, or lower portion of Fulton. A record of the stage of Waterhouse creek has been kept since April 9, 1904, by this Department. The stage of the water is determined by measuring down-stream from a reference point on the outer corner of a square gray stone in the west end of the north abutment of the North First street bridge, crossing Waterhouse creek between the Oswego river and the Oswego canal. The elevation of the reference point is 315.00.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River at Mouth of Waterhouse Creek, Fulton, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	309.30	311.80	313.70	312.17	311.97	311.22	310.07	308.82	308.82	309.02	309.12	309.27
2	309.05	311.55	312.80	312.12	312.12	310.97	310.02	309.47	308.77	308.97	309.07	309.37
3	309.10	311.55	312.20	312.17	312.42	310.97	309.97	309.12	308.87	308.92	309.07	309.37
4	309.20	311.30	312.10	312.22	312.22	310.97	309.91	309.17	308.82	309.07	309.07	309.32
5	309.20	311.10	312.10	312.27	312.32	310.87	309.92	309.17	308.87	309.02	309.12	309.27
6	309.30	311.25	312.00	312.17	312.62	310.97	310.07	308.97	308.82	308.87	309.12	309.42
7	309.40	311.25	311.85	312.22	312.52	311.07	309.77	309.02	308.82	309.07	309.17	309.37
8	309.40	311.45	311.90	311.97	312.27	310.97	309.72	309.07	308.97	308.97	309.17	309.37
9	309.60	311.50	311.75	312.12	312.37	310.97	309.27	307.07	308.97	309.02	309.07	309.37
10	309.45	310.90	311.65	312.27	312.52	310.97	309.57	309.12	309.97	308.97	309.22	309.47
11	309.70	311.00	311.75	312.27	312.42	310.97	309.67	308.97	309.02	309.02	309.17	309.02
12	309.85	311.00	311.83	312.27	312.47	310.98	309.77	308.87	308.97	308.87	309.22	309.27
13	309.65	311.10	311.88	312.37	312.47	310.97	309.62	308.87	309.02	308.97	309.22	309.32
14	309.65	310.80	311.73	312.72	312.27	310.92	309.42	308.82	309.02	308.92	309.27	309.37
15	309.75	311.25	311.98	312.52	312.72	310.77	309.52	308.97	308.92	309.02	309.22	309.32
16	309.70	310.50	311.78	312.57	312.57	310.72	309.42	309.02	308.97	308.72	309.27	309.17
17	309.65	310.75	311.73	312.62	312.37	310.62	309.32	309.07	308.92	308.92	309.32	309.22
18	309.65	310.70	311.53	312.67	312.17	310.67	309.47	309.02	308.97	308.92	309.32	309.37
19	309.65	310.90	311.58	312.67	312.12	310.57	309.67	309.07	308.72	309.02	309.27	309.37
20	309.65	311.20	311.48	312.47	311.97	310.67	309.62	309.07	309.17	308.97	309.22	309.07
21	309.60	311.10	311.33	312.42	311.87	310.67	309.52	309.17	308.92	308.97	309.07	309.27
22	309.65	311.60	311.53	312.42	311.87	310.47	309.47	309.07	308.87	309.07	309.07	309.07
23	309.80	311.40	311.33	312.32	311.52	310.47	309.32	309.07	308.82	309.07	309.07	309.27
24	310.20	311.95	311.23	312.27	311.77	310.37	309.17	309.12	308.97	308.97	309.37	309.37
25	310.85	312.40	311.73	311.97	311.57	310.42	309.22	309.07	308.97	309.37	309.37	309.97
26	310.65	312.85	311.98	312.12	311.47	310.27	309.57	309.12	308.67	309.07	309.32	309.37
27	310.70	312.50	312.03	311.92	311.57	310.37	309.47	308.97	308.92	309.12	309.27	309.37
28	310.67	312.30	312.18	311.82	311.32	310.32	309.17	309.02	308.97	309.02	309.22	309.47
29	310.60	......	312.28	311.72	311.18	310.17	309.12	309.07	308.92	309.07	309.27	309.37
30	311.00	......	312.33	311.87	311.02	310.12	309.07	309.27	309.07	309.02	309.32	309.47
31	311.45	......	312.13	......	311.37	......	308.87	308.82	......	309.02	......	309.37

OSWEGO RIVER ABOVE LOWER DAM AT FULTON, N. Y.

The elevation of the water-surface at a point above the lower dam at Fulton is determined each morning by this Department. A vertical board gage, reading to feet and tenths, is attached to the up-stream, center angle of the upper gates of the lower river lock. The gage is located on the right-hand bank of stream, a short distance above the dam, and observations have been taken since April 9, 1904. During 1909, the readings have been taken by measuring down from a reference point on the gage at elevation 338.03.

Mean Daily Elevation of Water-Surface (Barge Canal Datum) of Oswego River above Lower Dam at Fulton, N. Y.

DAY.	Jan.	Feb.	March.	April.	May.	June.
1909.						
1	331.33	332.98	334.83	334.73	334.58	333.53
2	328.53	332.48	334.83	334.78	335.33	333.43
3	331.93	332.53	334.78	334.73	334.93	333.38
4	331.33	332.43	334.73	335.13	334.93	333.43
5	331.23	332.58	334.58	335.23	334.78	333.38
6	332.13	333.18	334.43	334.68	334.83	334.08
7	331.23	333.98	335.30	334.63	334.83	333.73
8	331.43	333.38	334.68	334.53	334.73	333.38
9	331.63	332.98	334.23	334.73	335.43	333.38
10	332.63	332.88	334.28	334.78	334.93	333.43
11	330.98	332.78	334.33	334.83	334.93	333.48
12	332.18	332.23	334.48	334.88	334.73	333.48
13	331.33	333.03	334.48	334.78	334.83	334.03
14	331.53	333.73	335.03	334.88	334.83	333.33
15	331.98	333.18	334.58	335.03	334.78	333.28
16	331.58	332.83	334.38	335.08	335.33	333.03
17	332.78	332.38	334.33	335.18	334.88	332.93
18	331.08	332.63	334.13	335.33	334.63	333.03
19	331.58	332.83	334.18	335.13	334.63	333.08
20	331.63	333.18	334.13	335.03	334.58	333.58
21	331.73	334.03	334.63	334.93	334.58	333.03
22	331.58	333.83	334.33	334.93	334.33	332.78
23	332.23	333.83	333.78	334.83	334.83	332.53
24	333.38	334.48	333.78	334.78	334.23	332.53
25	333.28	334.93	334.18	334.23	334.03	332.48
26	333.08	334.78	334.53	334.73	333.93	332.43
27	333.03	334.88	334.63	334.48	333.88	333.33
28	333.08	335.38	335.13	334.20	333.73	332.48
29	332.68	....	334.83	334.43	333.73	*a*
30	332.58	....	334.83	334.48	334.33	....
31	333.43	....	334.73	....	333.83	....

a Record discontinued.

OSWEGO RIVER ABOVE OSWEGO FALLS DAM, FULTON, N. Y.

Observations of the stage of water in the pond above the Oswego Falls, or Upper Fulton dam, have been taken by this Department since April 9, 1904. A gage was formerly located on the river wall at the right-hand side of the stream, 16 feet up-stream from the crest of the dam. During 1909 readings have been taken each morning by measuring down from a reference point consisting of an arrow cut in the coping of the river wall near its up-stream end. The elevation of the reference point is 355.00. The water-elevation above the upper and lower dams in Fulton is controlled by mills. These mills have capacity sufficient to utilize the entire flow in ordinary or low stages of the stream.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River above Oswego Falls Dam, Fulton, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	346.30	348.50	349.45	350.60	350.05	349.55	347.80	348.50	347.60	347.30	347.25	347.20
2	345 80	348.60	349.60	350.73	351.50	349.40	347.45	347.85	347.30	347.10	347.45	347.25
3	348.40	349.70	349.35	350.55	350.75	349.45	347.40	347.30	347.25	347.50	347.30	347.15
4	348.00	348.55	349.20	351.19	350.65	349.40	348.95	347.30	347.95	347.50	347.35	347.30
5	347.50	348.25	350.00	350.50	351.20	349.35	348.05	347.30	347.55	347.20	347.45	347.65
6	349 80	348.90	350.25	350.50	350.65	350.40	348.75	347.40	347.50	347.15	347.15	347.30
7	348.65	349.90	351.00	350.50	350.65	349.65	347.05	347.55	347.80	347.40	347.50	347.25
8	347.40	349.00	350.20	350.40	350.85	349.40	347.45	348.25	347.30	347.20	347.55	347.25
9	347.30	349.45	350.15	350.55	351.80	349.30	347.30	347.55	347.30	347.30	347.30	347.35
10	348 70	348.60	349.80	350.40	351.00	349.25	347.55	347.60	347.30	347.30	347.10	346.90
11	348 15	348.55	349.90	349.40	350.90	349.30	348.50	347.40	347.65	347.05	347.05	347.20
12	347.00	348.65	349.80	350.60	351.40	349.20	347.65	347.30	347.45	347.40	347.25	347.70
13	347.25	348.65	349.95	350.70	351.00	350.05	347.40	347.25	347.20	347.30	347.20	347.35
14	347.35	349.65	348.80	350.70	350.95	349.50	347.30	347.15	346.95	347.20	347.20	347.30
15	347.30	348.60	350.00	350.80	350.80	349.10	347.25	347.40	347.50	347.00	347.20	347.30
16	347 20	348.25	349.80	350.95	352.05	349.05	347.05	347.85	347.15	347.40	347.10	347.50
17	348.90	348.38	349.75	351.00	350.90	348.95	346.95	347.25	347.45	347.50	347.10	347.35
18	347.55	348.50	350.15	351.80	350.60	348.95	348.30	347.20	346.90	347.25	346.90	347.25
19	347.75	348.50	349.50	351.05	350.70	348.85	347 55	347.45	347.85	347.20	347.15	347.10
20	347.35	348.90	349.50	350.85	350.60	349.90	346.85	347.55	347.30	347.55	347.20	347.50
21	347.35	349.85	350.20	350.70	350.50	349.05	346.75	347.51	346.85	347.25	347.35	347.45
22	347.10	349.70	349.40	350.70	350.40	348.65	347.05	348.05	346.80	347.05	347.20	347.30
23	347.25	349.70	349.20	350.65	351.10	348.65	347.15	347.65	346.90	346.85	347.25	347.40
24	349.55	350.39	349.50	350.60	350.30	348.55	347.25	347.65	346.90	347.45	347.20	347.40
25	349.00	350.90	350.20	351.35	350.10	348.65	348.35	347.45	347.15	347.40	346.75	347.30
26	348.90	350.80	350.10	350.40	349.95	348.45	346.75	347.45	347.75	347.25	347.20	347.20
27	348.85	350.50	350.20	350.20	349.85	349.55	347.40	347.35	347.35	347.05	347.15	347.30
28	348.75	360.40	351.05	350.15	349.85	348.55	347.45	347.45	346.95	347.40	347.70	347.30
29	349.10	......	350.60	350.05	349.80	348.20	347.25	347.80	346.70	347.30	347.25	347.45
30	348.50	......	350.65	350.20	350.25	347.95	347.50	347.70	346.40	347.25	347.05	347.70
31	349.45	......	350.65	......	349.80	......	347.20	347.35	......	347.55	......	347.40

OSWEGO RIVER AT THE MOUTH OF OX CREEK, NEAR FULTON, N. Y.

Ox creek enters the Oswego river four miles south, or up-stream from Fulton and on the left-hand side. A gage was established at the highway bridge just above the mouth of Ox creek, April 12, 1904, by this Department. A vertical gage, graduated decimally by copper staples and reading from zero to 9 feet, is used. The gage is attached to the down-stream side of the bridge near the left-hand abutment. The elevation of the zero mark is 347.71. Lock No. 7, or Morseman's lock, is located across the river from Ox creek. A bench-mark is located on this lock at elevation 354.53.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River at Mouth of Ox Creek near Fulton, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	346.71	351.61	352.21	352.11	352.01	350.61	348.71	348.41	347.61	347.51	347.71	347.81
2	346.51	351.41	352.11	352.11	352.51	350.51	348.51	348.21	347.71	347.71	347.61	347.81
3	348.21	351.41	352.11	352.11	352.31	350.41	348.41	347.81	347.41	347.51	347.61	347.81
4	348.21	351.31	352.11	352.51	352.31	350.31	349.21	347.51	347.71	347.71	347.71	374.81
5	348.21	351.01	351.91	352.11	352.31	350.41	349.31	347.51	348.21	347.71	347.81	347.71
6	349.31	351.31	351.91	352.01	352.21	350.91	348.71	347.71	347.71	347.71	347.51	347.71
7	348.71	351.21	351.91	352.11	352.41	350.61	348.41	347.41	347.71	347.71	347.71	347.61
8	348.61	350.51	351.51	351.91	352.41	350.41	348.21	347.91	347.61	347.71	347.91	347.61
9	348.31	350.61	351.51	352.01	352.71	350.31	348.01	347.81	347.61	347.71	347.71	347.71
10	348.81	350.51	351.31	352.11	352.61	350.41	348.11	347.71	347.71	347.41	347.61	347.71
11	348.61	350.41	351.61	352.51	352.51	350.31	348.71	347.51	347.71	347.51	347.71	347.71
12	348.31	350.41	351.61	352.21	352.61	350.31	348.41	347.31	348.01	347.51	347.71	347.41
13	348.31	350.31	351.61	352.01	352.51	350.71	348.21	347.51	347.81	347.51	347.71	347.61
14	348.31	350.41	351.91	352.51	352.51	350.31	348.01	347.21	347.51	347.61	347.61	347.61
15	348.41	349.91	351.51	352.61	352.31	350.01	348.01	348.11	347.51	347.51	347.71	347.61
16	348.41	349.71	351.41	352.71	352.71	349.91	347.61	348.11	347.61	347.51	347.51	347.71
17	348.51	349.81	351.31	352.71	352.31	349.81	347.51	347.71	347.51	347.71	347.41	347.71
18	348.21	349.91	351.31	353.01	352.21	349.81	348.41	347.31	347.41	347.51	347.41	347.71
19	348.41	350.11	351.11	352.71	352.11	349.71	348.01	347.71	348.01	347.41	347.51	347.71
20	348.31	350.31	351.11	352.51	352.01	350.31	347.41	347.71	347.71	347.41	347.61	347.61
21	348.21	350.91	351.31	352.41	351.81	349.71	347.91	347.61	347.61	347.41	347.71	347.51
22	348.41	351.01	350.91	352.41	351.71	349.51	347.71	348.31	347.41	347.61	347.71	347.91
23	348.71	351.01	350.71	352.31	351.91	349.51	348.01	348.01	347.41	347.51	347.71	347.91
24	350.21	352.01	350.71	352.11	351.51	349.41	347.91	347.71	347.41	347.91	347.71	347.91
25	350.21	352.51	351.91	352.31	351.31	349.31	348.41	347.61	347.71	347.71	347.61	347.51
26	350.01	352.31	351.91	351.91	351.11	349.31	348.11	347.51	347.61	347.61	347.61	347.41
27	349.91	352.21	352.01	351.81	351.01	349.91	347.81	347.71	347.71	347.51	347.61	347.61
28	349.91	352.41	352.41	351.61	350.91	349.41	347.71	347.91	347.21	347.71	347.81	347.71
29	350.11	......	352.21	351.51	350.81	349.11	347.71	348.01	347.11	347.41	347.81	347.61
30	351.01	......	352.21	351.71	351.11	348.91	348.01	347.61	347.01	347.61	347.81	347.61
31	351.51	......	352.11	......	350.71	......	347.81	347.71	......	347.71	......	347.61

OSWEGO RIVER BELOW SITE OF OLD HORSESHOE DAM.

The gage at this station was erected April 13, 1904. It is located on the right-hand bank of the Oswego river on a strip of land between the river and Oswego canal, a short distance below guard-lock No. 2. The readings are taken by means of a weight and chain in conjunction with a horizontal scale. The scale is attached at one end to a large buttonwood tree. The other end projects over the water. Readings are taken usually about noon each day by Frank M. Hughes.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River below Site of Old Horseshoe Dam.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	348.64	354.14	352.64	352.54	*a*	350.74	348.74	*a*	347.44	347.44	347.94	348.04
2	*a*	353.94	352.54	352.54	*a*	350.74	348.69	*a*	347.54	347.84	347.84	347.94
3	*a*	353.64	352.54	352.44	*a*	350.74	348.54	*a*	347.54	*a*	347.74	347.94
4	348.64	353.54	352.44	*a*	*a*	350.64	*a*	347.54	347.54	347.44	347.74	347.94
5	348.24	353.34	352.34	352.54	*a*	350.64	*a*	347.64	*a*	347.54	347.74	*a*
6	349.04	352.84	352.14	352.24	*a*	*a*	349.34	347.74	347.94	347.54	347.74	347.94
7	349.44	*a*	*a*	352.34	*a*	350.74	349.34	347.84	347.74	347.44	*a*	347.84
8	349.54	350.94	351.94	352.44	*a*	*a*	349.34	*a*	347.74	347.44	348.14	347.64
9	349.44	351.24	351.94	352.54	*a*	*a*	349.34	348.04	347.64	347.34	347.94	347.64
10	*a*	352.04	351.94	352.54	352.84	*a*	349.34	347.64	347.64	*a*	347.94	347.24
11	349.04	353.44	351.74	*a*	352.84	*a*	*a*	347.34	347.64	347.64	347.94	347.14
12	348.94	354.14	351.84	352.54	352.84	*a*	349.44	347.44	*a*	347.54	348.04	*a*
13	349.14	351.84	351.94	352.44	352.74	*a*	348.64	347.54	347.64	347.54	348.04	347.74
14	349.44	*a*	*a*	352.84	352.74	*a*	348.24	347.64	347.64	347.64	*a*	347.84
15	349.64	350.64	351.94	353.04	352.74	*a*	348.24	*a*	347.64	347.74	348.24	347.94
16	350.04	352.94	351.74	353.04	*a*	*a*	348.14	348.34	347.74	347.84	347.94	348.04
17	*a*	352.74	351.64	353.04	352.64	*a*	348.14	348.04	347.54	*a*	347.94	348.14
18	349.34	351.94	352.04	*a*	352.44	*a*	*a*	347.84	347.34	347.84	347.84	348.64
19	349.74	351.54	351.84	353.04	352.24	350.14	347.94	347.74	*a*	347.74	347.84	*a*
20	349.64	350.84	351.34	352.94	352.14	*a*	347.84	347.84	347.74	347.64	347.84	348.34
21	349.54	*a*	*a*	352.84	352.04	350.24	347.94	347.64	347.64	347.54	*a*	348.44
22	349.44	351.24	351.24	352.74	351.94	349.84	348.04	*a*	347.64	347.44	348.14	348.64
23	349.44	351.34	351.04	352.64	351.94	349.74	348.04	348.34	347.74	347.34	347.94	348.64
24	*a*	352.44	351.64	352.54	351.94	349.64	348.04	348.14	347.74	*a*	347.94	348.64
25	350.74	352.44	352.24	*a*	351.84	349.54	*a*	347.94	347.64	347.84	347.94	348.44
26	350.54	352.74	352.24	352.44	351.84	349.44	348.44	347.74	*a*	347.74	347.94	*a*
27	350.44	352.54	352.34	352.14	351.84	*a*	348.04	347.64	347.84	347.74	347.94	348.94
28	350.34	*a*	*a*	352.14	351.84	349.44	347.94	347.64	347.44	347.74	*a*	348.94
29	351.44	......	352.54	352.14	351.84	349.14	348.14	*a*	347.14	347.74	348.14	348.84
30	353.14	......	352.54	352.04	*a*	348.94	348.34	347.74	347.04	347.74	348.04	349.04
31	*a*	......	352.54	......	*a*	......	348.24	347.64	......	*a*	......	349.24

a No record.

OSWEGO RIVER ABOVE SITE OF OLD HORSESHOE DAM.

A gage consisting of horizontal scale with weight and chain was erected a short distance above guard-lock No. 2, April 13, 1904. One end of the gage box projects horizontally over the water. The observer is Frank M. Hughes. Readings are usually taken about noon each day. The elevation of the datum of this gage, as well as that of the gage below, is determined from a benchmark on guard-lock No. 2, having an elevation 360.91.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River above Site of Old Horseshoe Dam.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	350.0	354.4	*a*	353.6	353.4	351.9	350.3	......	349.6	349.8	350.0	349.9
2	350.3	354.2	*a*	353.6	......	351.8	350.3	349.7	349.8	350.0	350.0	349.9
3	......	354.1	*a*	353.6	353.8	351.8	350.3	349.7	349.8	......	350.0	349.9
4	349.8	354.0	*a*	......	353.8	353.8	......	349.7	349.7	349.8	350.0	350.0
5	349.8	353.7	*a*	353.6	353.7	351.8	......	349.7	349.7	349.7	350.0	......
6	350.1	353.2	*a*	352.9	353.7	......	350.0	349.7	349.8	349.6	350.0	349.9
7	350.7	......	......	353.0	353.8	351.8	350.0	349.7	349.7	349.6	......	349.8
8	351.1	351.7	353.0	353.2	353.8	351.8	350.0	......	349.7	349.5	350.0	349.8
9	351.4	352.2	352.9	353.4	......	351.7	350.0	349.6	349.7	349.3	350.0	349.8
10	......	353.1	352.8	353.6	354.0	351.7	350.0	349.4	349.8	......	350.0	349.7
11	350.2	353.8	353.0	......	354.0	351.7	......	349.3	349.8	349.9	350.0	349.7
12	350.2	354.4	353.3	353.6	354.0	351.7	350.0	349.2	......	349.9	350.0	......
13	350.6	352.3	353.1	353.6	354.0	......	349.9	349.1	349.7	349.9	349.9	349.8
14	351.3	......	......	353.7	353.9	351.5	349.9	349.1	349.7	349.9	......	349.8
15	351.3	351.5	353.1	353.7	353.8	351.4	349.8	......	349.7	349.9	349.9	349.7
16	351.7	353.1	352.9	353.7	......	351.4	349.7	349.8	349.8	350.0	349.8	349.8
17	......	352.9	352.8	353.7	353.8	351.3	349.7	349.7	349.7	......	349.8	349.8
18	351.4	352.2	353.0	......	353.6	351.2	......	349.7	349.7	350.0	349.8	349.9
19	351.9	351.9	352.8	354.0	353.4	351.1	349.8	349.7	......	350.0	349.8	348.3
20	......	351.6	352.5	354.0	353.3	......	349.7	349.7	350.0	350.0	349.8	350.0
21	351.0	......	......	354.0	353.2	351.2	349.6	349.3	349.9	350.0	......	350.1
22	350.7	352.2	352.4	353.9	353.1	351.1	349.5	......	349.9	350.0	349.9	350.0
23	350.6	352.4	352.2	353.7	353.1	351.0	349.5	349.6	349.9	349.8	349.9	349.9
24	......	*a*	352.8	353.6	353.0	350.9	349.5	349.5	349.9	......	349.8	349.1
25	352.2	*a*	353.3	......	352.9	350.8	......	349.4	349.9	350.0	349.7	348.2
26	351.4	*a*	353.2	353.4	352.9	350.7	349.6	349.4	......	349.9	349.7	......
27	351.4	*a*	353.4	353.2	352.9	......	349.6	349.3	349.8	349.9	349.8	350.0
28	351.4	......	......	353.1	352.8	350.7	349.6	349.3	349.7	349.9	......	350.0
29	352.1	......	353.7	353.1	352.8	350.5	349.6	......	349.7	350.0	349.9	349.9
30	353.3	......	353.6	353.1	......	350.4	349.6	349.7	349.7	350.0	349.9	350.1
31	......	......	353.6	......	......	......	349.6	349.6	......	......	......	350.3

a Gage out of repair.

OSWEGO RIVER AT HINMANSVILLE BRIDGE.

This gage is located on the down-stream side of the left-hand span of the bridge crossing Oswego river at Hinmansville. The gage is of the chain-and-weight type. The gage box is attached horizontally to the bridge floor outside the hand-railing and the scale is graduated from zero to nine feet. The standard datum of this gage is 348.643. Length of chain is 19.95 ft. The gage was established April 13, 1904, and is read each day about noon by Frank M. Hughes. The gage is located near lock No. 6 on the Oswego canal. A bench-mark on this lock is at elevation 361.69. Current-meter measurements were formerly made at this bridge, but as the stream is obstructed by grass at times and there are other objectionable features, these measurements have not been continued.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River at Hinmansville Bridge.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	350.84	354.84	355.64	355.44	355.24	353.54	351.34	349.14	349.94	350.24	350.54	350.64
2	350.74	354.74	355.54	355.44	355.54	353.44	351.34	349.64	349.84	350.34	350.34	350.64
3	349.74	354.64	355.44	355.44	355.44	353.24	351.34	349.64	349.74	349.54	350.44	350.64
4	350.44	354.54	355.34	355.44	355.64	353.24	*a*	349.74	349.74	349.94	350.54	350.64
5	350.54	354.14	355.24	355.44	355.64	353.34	*a*	349.74	349.34	350.14	350.44	349.94
6	350.94	354.04	355.04	355.14	355.64	353.34	351.14	349.84	350.04	350.24	350.44	350.64
7	351.84	*a*	354.84	355.24	355.64	353.44	351.14	350.14	350.04	350.34	349.64	350.44
8	351.84	353.14	354.84	355.34	355.74	353.34	351.04	349.14	349.84	350.24	350.44	350.44
9	352.04	353.74	354.64	355.44	355.84	353.24	351.04	350.04	349.94	349.44	350.54	350.44
10	*a*	354.34	354.54	355.44	355.84	353.24	350.94	349.84	350.04	349.44	350.54	350.44
11	351.14	354.64	354.84	355.44	355.94	353.14	350.74	349.64	350.24	349.44	350.44	350.44
12	351.14	355.84	354.84	355.44	355.84	353.14	350.84	349.44	349.54	350.24	350.54	349.54
13	351.44	353.54	354.94	355.34	355.84	352.94	350.64	349.14	350.14	350.44	350.64	350.54
14	351.84	352.64	354.94	355.84	355.74	352.84	350.54	349.24	350.04	350.34	349.84	350.44
15	352.14	352.74	354.94	356.04	355.54	352.74	350.44	349.24	350.24	350.34	350.54	350.44
16	352.24	353.74	354.74	356.14	355.64	352.74	350.44	350.24	350.24	350.34	350.44	350.64
17	352.04	353.94	354.74	356.14	355.44	352.64	350.34	350.14	350.24	349.64	350.44	351.34
18	352.24	353.64	354.64	356.04	355.24	352.64	350.04	350.04	350.24	350.14	350.44	350.74
19	352.34	352.84	354.34	356.04	355.14	352.44	350.44	350.04	349.44	350.04	350.44	*a*
20	352.14	353.04	354.24	355.84	355.14	352.44	349.94	350.04	349.94	349.94	350.44	352.74
21	352.04	352.24	354.04	355.74	354.94	352.44	350.04	350.04	349.84	349.94	349.74	352.64
22	351.34	353.74	354.14	355.74	354.94	352.34	350.14	349.54	349.94	349.84	350.54	352.64
23	351.44	353.94	353.94	355.54	354.74	352.34	350.04	350.14	350.14	350.24	350.54	352.64
24	352.04	355.34	354.34	355.44	354.04	352.24	350.04	350.04	350.24	349.54	350.64	351.64
25	352.44	355.54	354.74	355.34	354.34	352.24	349.74	349.94	349.94	350.34	350.44	351.14
26	352.54	355.64	354.94	355.24	354.14	352.14	350.34	349.94	349.64	350.34	350.54	349.84
27	352.64	355.64	355.04	355.04	354.04	351.94	350.24	349.74	350.34	350.34	350.64	350.94
28	352.74	355.64	355.24	354.84	353.94	351.84	350.24	349.74	350.24	350.34	350.04	350.64
29	353.44	......	355.54	354.84	353.84	351.64	350.14	349.54	350.14	350.34	350.54	350.74
30	355.14	......	355.44	355.04	353.74	351.54	350.14	350.14	350.14	350.44	350.64	350.74
31	354.94	......	355.44	......	353.64	......	350.04	350.24	......	349.74	......	350.94

a No record.

Oswego River below Dam at Phoenix, N. Y.

A gage was established April 16, 1904, by this Department and readings are taken about noon each day by George Archambeau. The gage at present used is a vertical scale divided decimally by coppered staples from zero to nine feet. It is attached to the down-stream side of the Pendergast Mill on the right-hand bank of the river. The gage zero is at elevation 352.95. The gage is located 255 feet down-stream from the right-hand end of the dam.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River below Dam at Phoenix, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	353.15	356.75	358.45	358.15	358.15	355.70	353.45	353.20	352.25	352.30	352.30	352.00
2	353.15	356.55	358.35	358.15	358.35	355.55	353.45	353.20	352.65	352.25	352.25	352.00
3	353.10	356.45	358.35	358.15	358.45	355.45	353.35	353.15	352.65	352.25	352.25	352.05
4	353.10	356.15	358.35	358.20	358.40	355.35	353.35	353.15	352.45	352.25	352.25	352.05
5	353.10	355.95	358.25	358.15	358.45	355.35	353.35	353.15	352.35	352.25	352.25	352.35
6	353.25	355.65	357.85	358.05	358.35	355.45	353.35	353.15	352.65	352.30	352.25	352.10
7	353.45	354.95	357.65	357.95	358.45	355.35	353.35	353.15	352.65	352.30	352.55	352.05
8	353.65	355.25	357.55	357.85	358.45	355.35	353.35	353.15	352.55	352.35	352.15	352.05
9	353.35	355.55	357.45	357.95	358.55	355.35	353.35	353.15	352.45	352.35	352.10	352.05
10	353.35	355.95	357.35	358.05	358.60	355.40	353.25	352.95	352.35	352.25	352.10	352.20
11	353.40	356.15	357.35	358.15	358.65	355.40	353.25	352.95	352.30	352.20	352.10	352.15
12	353.40	355.95	357.35	358.20	358.75	355.40	353.25	352.95	352.45	352.25	352.15	352.25
13	353.95	355.25	357.35	358.25	358.65	355.15	353.25	352.95	352.55	352.25	352.10	352.10
14	354.35	354.65	357.35	358.40	358.55	355.00	353.25	352.95	352.65	352.20	352.50	352.95
15	353.55	354.65	357.35	358.60	358.50	354.85	353.25	352.95	352.70	352.25	352.10	352.05
16	354.25	354.95	357.35	358.80	358.35	354.75	353.25	353.25	352.60	352.25	352.10	352.15
17	354.75	355.35	357.15	359.00	358.25	354.70	353.25	353.25	352.50	352.25	352.10	352.20
18	355.35	354.85	357.15	358.95	358.10	354.65	353.25	353.25	353.35	352.25	352.05	352.25
19	355.05	353.55	357.05	358.75	357.85	354.55	353.25	353.25	352.65	352.25	352.05	352.50
20	354.85	355.15	356.75	358.65	357.75	354.55	353.25	352.45	352.50	352.25	352.05	352.30
21	354.55	355.55	356.50	358.45	357.60	354.55	353.25	352.50	352.35	352.25	352.45	352.25
22	354.00	355.95	356.20	358.30	357.35	354.55	353.25	352.45	352.35	352.25	352.75	352.20
23	353.95	356.45	356.15	358.25	357.15	354.55	353.25	352.55	352.35	352.25	352.00	352.15
24	354.40	357.65	355.95	358.15	356.95	354.50	353.25	352.55	352.30	352.20	352.00	352.15
25	354.75	357.95	357.65	358.00	356.75	354.25	353.25	352.45	352.30	352.20	352.05	352.20
26	354.65	358.45	357.65	357.80	356.60	354.00	353.25	352.50	352.55	352.25	352.05	352.35
27	354.75	358.45	357.75	357.65	356.45	353.75	353.20	352.55	352.45	352.25	352.05	*a*
28	354.80	358.45	357.75	357.75	356.25	353.85	353.20	352.45	352.35	352.25	352.55	*a*
29	354.95	......	358.15	357.85	356.15	353.70	353.20	352.35	352.25	352.25	352.95	*a*
30	355.35	......	358.35	357.95	355.95	353.75	353.20	352.65	352.25	352.20	352.00	*a*
31	356.05	......	358.15	......	355.85	......	353.20	352.65	......	352.55	......	*a*

a No record.

OSWEGO RIVER ABOVE DAM AT PHOENIX, N. Y.

Observations of the stage of water in the pond above Phœnix dam have been taken by George Archambeau about noon each day, beginning April 16, 1904. The gage at present used is a vertical scale graduated to feet and tenths by copper staples and reading from zero to nine feet. It is attached to the west side of the bulkhead wall, 105 feet east of the east, or right-hand end of the dam. The gage is a few feet above the line of the crest of the dam and is in the entrance of the hydraulic canal. The zero mark is at elevation 357.31. The crest of the dam is at elevation about 359.13. Datum of this gage, as well as that of the gage below, is determined from a bench-mark on the Phœnix guard-lock, the elevation of which is 365.40. Water is diverted to mills at both ends of the dam. Flash-boards are placed on the dam at times. During extreme high water the dam is submerged by back-water from below.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oswego River above Dam at Phoenix, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	359.51	362.21	363.66	363.46	363.51	362.51	361.31	361.06	360.71	360.51	360.66	360.86
2	360.31	362.06	363.51	363.46	363.71	362.41	361.21	360.36	360.51	360.51	360.61	360.86
3	360.91	362.01	363.61	363.41	363.61	362.36	361.01	360.16	360.61	360.51	360.51	360.81
4	360.81	361.91	363.46	363.56	363.61	362.36	361.41	360.46	360.61	360.51	360.41	360.81
5	360.56	361.81	363.31	363.41	363.66	362.31	361.41	360.61	361.01	360.46	360.21	361.21
6	361.16	362.21	363.26	363.41	363.61	362.41	361.11	360.81	360.56	360.41	360.01	360.91
7	361.56	362.31	363.31	363.31	363.61	362.31	360.96	360.81	360.71	360.41	361.01	360.81
8	361.21	362.26	363.06	362.11	363.71	362.31	360.86	361.06	360.76	360.36	360.81	360.76
9	361.21	362.26	362.91	363.31	363.81	362.26	360.81	360.81	360.81	360.36	360.71	360.66
10	361.51	362.31	363.06	363.41	363.71	362.26	360.76	360.71	360.71	360.41	360.76	359.26
11	361.46	362.21	363.21	363.56	363.61	362.21	361.21	360.61	360.61	360.41	360.81	360.01
12	361.66	362.21	363.21	363.51	363.71	362.21	360.91	360.51	361.01	360.41	360.91	360.81
13	361.41	362.16	363.21	363.51	363.81	362.16	360.61	360.51	360.81	360.36	360.96	360.81
14	361.51	362.21	363.31	363.56	363.71	362.16	360.56	360.46	360.71	360.36	361.41	360.81
15	361.56	362.01	363.21	363.06	363.61	362.11	360.71	361.11	360.76	360.31	361.01	360.86
16	361.51	361.91	363.11	363.71	363.66	362.06	360.71	360.66	360.76	360.31	360.96	360.81
17	361.61	361.96	363.01	363.81	363.51	362.01	360.31	360.66	360.76	360.21	360.91	360.81
18	361.51	361.96	362.96	363.81	363.51	361.96	360.61	360.61	360.76	360.26	360.61	360.81
19	361.51	361.96	362.81	363.76	363.46	361.91	360.31	360.66	361.01	360.26	360.71	361.21
20	361.51	362.21	362.81	363.76	363.31	362.01	360.36	360.61	360.86	360.21	360.76	361.06
21	361.31	362.71	362.96	363.71	363.16	362.01	360.46	360.61	360.71	360.11	361.16	360.96
22	361.36	362.61	362.76	363.61	363.11	362.01	360.61	361.06	360.66	360.01	361.06	360.91
23	361.46	362.81	362.76	363.61	363.01	361.96	360.46	360.81	360.61	360.16	360.76	360.81
24	361.96	363.31	362.31	363.51	362.91	361.86	360.41	360.61	360.61	360.26	360.71	360.76
25	362.21	363.51	363.16	363.51	362.91	361.81	361.11	360.61	360.61	360.31	360.76	360.76
26	362.21	363.66	363.16	363.42	362.81	361.66	360.86	360.61	360.51	360.31	360.06	360.91
27	362.21	363.61	363.31	363.31	362.71	361.81	360.86	360.56	360.51	360.26	360.81	360.81
28	362.26	363.81	363.61	363.31	362.66	361.46	360.81	360.26	360.56	360.11	361.21	370.76
29	362.46	......	363.41	363.36	362.66	361.41	360.76	361.01	360.51	360.06	360.86	360.66
30	362.31	......	363.41	363.46	362.61	361.36	360.71	360.61	360.51	360.11	360.81	360.41
31	*a*	......	363.41	......	362.61	......	360.66	360.51	......	360.71	......	360.31

a No record.

GAGES ON ONEIDA LAKE AND RIVER.

Oneida lake has a water-surface area of 80 square miles and lies at an elevation of 370 feet above tide. The drainage basin within a radius of 10 miles to the south and west is relatively flat, with numerous swampy tracts. The lake receives, through Chittenango and Oneida creeks, drainage from an extensive area of the central New York plateau and, through Wood and Fish creeks on the east, drainage from a portion of the west slope of the plateau bordering the Adirondack mountains. On the north the drainage area is less extensive and the inflowing streams are small.[a]

The outflow from the lake through Oneida river joins Seneca river at Three River Point, forming Oswego river. From Brewerton to Three River Point the distance, in a straight line, is but eight miles; following the windings of the stream it is sixteen miles.

Gages for Determining Elevation of Water-surface on Oneida River.

LOCATION.	DISTANCE IN MILES.*		Usual time of reading gage.	Present type of gage.
	Place to place.	From Three River Point.		
Three River Point......	0	0	7 a. m.	Board with coppered staples.
Below Oak Orchard dam.	5.3	5.3	6 a. m.; 7 p. m.	Board with coppered staples.
Above Oak Orchard dam.	0	5.3	6 a. m.; 7 p. m.	Board with coppered staples.
Below Caughdenoy lock.	7.4	12.7	8 a. m.	Board with coppered staples.
Above Caughdenoy lock.	0	12.7	8 a. m.	Board with coppered staples.
Brewerton.............	4.0	16.7	8 a. m.	Board with coppered staples.
Sylvan Beach..........	21.6	38.3	8 a. m.	Graduated board.

* Measured along course of stream on U. S. Geological Survey topographic map.

[a] A portion of the drainage area is shown on the Syracuse, Chittenango, Oneida, Oriskany, Morrisville, Cazenovia and Tully topographic atlas sheets of the United States Geological Survey.

ONEIDA RIVER AT THREE RIVER POINT, N. Y.

A vertical gage is attached to the right-hand side of the upstream end of the pier nearest the left-hand bank of Oneida river on the highway bridge crossing the river at Three River Point. This gage is so located as to show the water-level at the mouths of Oneida and Seneca rivers, and at the head of Oswego river. The gage is graduated decimally from zero to nine feet and has been read each morning by J. Chamberlain, beginning April 16, 1904.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oneida River at Three River Point, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	360.17	362.67	364.67	364.77	364.47	363.37	361.57	360.67	360.57	360.57	361.27	360.67
2	360.67	362.57	364.67	364.77	364.97	363.27	361.47	360.57	360.57	360.67	360.67	360.67
3	360.67	362.57	364.57	364.77	364.97	363.17	361.57	361.17	360.57	361.07	360.57	360.67
4	360.57	362.47	364.57	364.87	364.77	363.17	361.57	360.57	361.07	361.17	360.57	360.67
5	360.47	362.47	364.47	364.77	364.47	363.17	361.47	360.57	360.57	360.67	360.47	361.17
6	361.27	362.57	364.37	364.67	364.97	363.27	361.57	361.07	360.57	360.67	360.37	361.27
7	361.67	362.67	364.37	364.67	364.97	363.27	361.47	360.67	360.67	361.07	360.59	361.17
8	361.47	363.17	364.17	364.57	364.27	363.27	361.27	360.57	360.57	360.57	361.27	360.67
9	361.47	363.17	364.17	364.67	364.28	363.17	361.27	360.67	360.67	360.57	361.17	360.67
10	361.47	363.17	364.17	364.87	365.17	363.17	361.17	361.17	360.67	361.07	361.17	360.17
11	361.67	363.17	364.17	364.87	364.28	362.67	361.17	360.57	360.57	361.17	361.17	359.67
12	361.47	362.67	363.67	364.87	364.28	362.67	361.27	360.57	361.27	360.67	361.17	360.57
13	361.67	362.67	361.67	364.77	364.28	362.67	361.47	360.57	361.17	361.07	360.67	360.27
14	361.57	362.67	364.27	364.27	364.27	363.67	361.17	360.57	360.67	361.07	361.27	361.17
15	361.47	362.67	364.37	365.17	364.27	363.07	360.67	360.57	360.57	360.57	361.27	360.67
16	361.47	362.67	364.17	365.27	364.27	362.47	360.57	360.57	360.67	360.57	360.67	360.57
17	361.67	362.57	364.17	365.27	364.97	362.47	360.67	361.17	360.57	361.07	360.67	360.67
18	361.67	362.47	364.17	365.37	364.77	362.47	360.67	360.67	360.67	361.17	360.67	360.67
19	361.67	362.37	363.67	365.27	364.77	362.47	360.57	360.57	360.67	360.57	360.67	361.27
20	361.47	363.67	363.67	365.17	364.97	362.47	361.17	360.67	361.17	360.57	361.17	361.37
21	361.47	363.17	363.27	364.28	364.57	362.47	360.47	360.67	360.67	360.57	361.17	360.67
22	361.47	363.37	363.67	364.28	364.37	362.37	361.17	360.57	360.67	360.37	361.17	360.67
23	361.47	363.57	363.47	364.27	364.27	362.27	360.67	360.67	360.67	361.07	361.17	360.57
24	361.47	364.77	363.47	364.97	364.17	362.27	360.47	361.17	360.67	360.57	361.17	360.57
25	362.47	365.17	363.67	364.77	363.67	362.27	361.17	360.57	360.67	360.67	360.67	360.57
26	362.57	365.17	364.37	364.67	363.57	362.17	360.47	360.57	360.67	360.57	360.57	361.37
27	362.57	364.67	364.37	364.47	363.47	362.27	361.17	360.57	361.17	361.07	361.17	361.37
28	362.67	364.67	364.67	364.37	363.47	362.27	360.67	360.57	360.67	361.07	361.27	361.17
29	363.47	......	364.67	364.17	363.37	362.17	360.67	361.47	360.57	361.07	361.37	360.67
30	362.67	......	364.67	364.27	363.37	361.67	360.67	360.67	360.57	360.57	361.17	360.57
31	362.69	......	364.67	......	363.47		360.57	360.57	......	360.67	......	360.57

Oneida River at Schroeppel's Bridge, Euclid, N. Y.

The gaging station was established August 30, 1902, and is maintained by the U. S. Geological Survey in coöperation with this Department. It is located seven miles up-stream from Three River Point.

Observations of stream stage, which are taken each morning and evening by Louis McArthur, are made from a gage above Oak Orchard State dam, 0.4 mile above Schroeppel's bridge. The gage readings have been taken above the dam to avoid backwater from ice or other causes as far as possible. A calibration curve for the cross-section of the stream at Schroeppel's bridge has been obtained by current-meter measurements.

Above a certain stage the dam becomes submerged and the discharge is modified. A special rating table, deduced from measurements made during the period of submergence, is used to calculate the discharge during the high-water period. Allowance is made for the opening of lock-paddles in winter, and for flash-boards when used.

Mean Daily Discharge, Second-feet, of Oneida River at Schroeppel's Bridge, Euclid, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	814	3,362	7,542	6,864	6,864	4,335	1,874	820	722	280	1,471	1,162
2	918	3,081	7,408	6,864	6,989	4,226	1,801	722	722	265	1,471	1,208
3	1,072	2,991	7,276	6,864	7,382	4,559	1,731	722	654	320	1,532	1,305
4	1,305	2,991	6,901	6,864	7,248	4,676	1,598	722	460	621	1,598	1,208
5	1,891	3,081	6,399	6,864	7,248	4,676	1,598	654	370	540	1,532	1,162
6	1,692	2,991	6,018	6,864	7,649	4,476	1,532	654	566	540	1,471	1,030
7	1,463	2,819	6,018	6,111	7,649	4,676	1,598	654	654	566	1,471	1,072
8	1,518	2,904	6,018	5,022	7,248	4,559	1,532	654	722	722	1,414	1,208
9	1,631	3,174	5,650	5,858	7,248	4,559	1,471	688	722	758	1,249	1,255
10	1,632	2,904	5,892	6,864	7,382	4,559	1,414	654	830	958	1,048	1,305
11	1,758	2,819	6,018	8,188	7,516	4,445	1,249	654	958	1,002	1,196	1,305
12	1,824	2,904	5,770	8,188	7,929	4,335	958	621	912	792	1,358	1,305
13	1,824	2,819	5,770	8,320	7,929	4,119	758	654	870	621	1,358	1,208
14	1,891	2,819	5,770	9,010	7,516	3,799	566	722	830	566	1,358	1,162
15	1,891	2,904	5,770	9,298	7,382	3,799	510	758	758	540	1,414	1,208
16	1,891	2,819	5,770	9,010	7,248	3,799	540	792	830	540	1,030	1,208
17	1,891	2,904	5,650	8,870	7,116	3,596	510	722	958	621	814	1,208
18	1,824	2,991	5,182	8,732	6,864	3,596	510	722	958	958	814	1,208
19	1,758	3,081	4,719	8,598	6,495	3,596	480	654	958	1,048	814	1,255
20	1,631	4,171	4,836	8,460	6,111	3,596	510	688	912	1,145	814	1,305
21	1,631	4,171	4,836	7,786	5,610	3,300	592	688	792	1,145	752	1,305
22	1,961	4,386	4,836	7,516	5,254	2,921	621	654	654	1,249	726	1,255
23	2,250	4,836	5,298	7,116	5,022	2,831	688	621	480	1,145	752	1,305
24	2,570	6,018	6,526	6,864	4,908	2,659	830	654	370	1,196	814	1,208
25	2,991	6,144	6,778	6,864	4,908	2,494	870	592	320	1,303	781	1,356
26	3,659	6,655	6,655	6,741	4,559	2,494	870	621	440	1,249	918	1,409
27	3,756	7,276	6,399	6,864	4,445	2,494	792	654	425	1,249	952	1,356
28	3,756	7,542	6,399	6,741	4,335	2,411	870	654	410	1,249	1,030	1,305
29	3,460	......	6,655	6,366	4,226	2,090	958	565	383	1,303	1,162	1,305
30	3,362	......	7,024	6,366	4,226	2,015	958	565	383	1,358	1,208	1,208
31	3,362	......	7,149	......	4,226	......	870	722	......	1,358	......	1,208
Mean	2,095	3,841	6,095	7,365	6,346	3,663	1,021	675	667	878	1,144	1,242

Monthly Discharge of Oneida River at Schroeppel's Bridge, Euclid, N. Y.
[Drainage area, 1,400 square miles.]

MONTH.	Discharge in Second-feet.				Run-off.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	3,756	814	2,095	1.49	1.71
February	7,542	2,819	3,841	2.74	2.85
March	7,542	4,719	6,095	4.35	5.00
April	9,298	5,022	7,365	5.26	5.89
May	7,929	4,226	6,316	4.53	5.21
June	4,676	2,015	3,663	2.62	2.93
July	1,874	480	1,021	0.729	0.838
August	830	565	675	0.482	0.554
September	958	320	667	0.476	0.533
October	1,358	265	878	0.627	0.721
November	1,598	726	1,144	0.817	0.915
December	1,409	1,030	1,242	0.887	1.02

ONEIDA RIVER BELOW OAK ORCHARD DAM.

A gage was erected by this Department, April 23, 1904, on the fender piles at the lock exit below Oak Orchard dam. The gage is graduated decimally from zero to nine feet, by means of coppered staples. Readings are taken each morning and night by Louis McArthur.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oneida River below Oak Orchard Dam.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	360.87	364.32	366.67	366.57	366.37	364.42	362.32	360.67	360.79	360.66	361.17	361.42
2	360.87	364.27	366.67	366.52	366.47	364.52	362.17	360.67	360.83	360.66	361.02	361.47
3	361.12	364.32	366.67	366.47	366.57	364.57	362.07	360.67	360.97	360.92	360.66	361.47
4	361.62	364.47	366.62	366.37	366.52	364.57	361.97	360.52	361.07	360.97	360.62	361.47
5	362.02	364.32	366,37	366.37	366.47	364.52	361.97	360.52	360.79	360.87	560.49	361.52
6	361.97	364.12	366.17	366.37	366.47	364.47	364.47	360.62	360.74	360.83	360.37	361.47
7	361.87	363.97	366.02	366.17	366.57	364.47	361.87	360.72	360.79	360.87	360.49	361.47
8	362.02	364.22	365.97	366.02	366.57	364.52	361.92	360.92	360.70	360.87	361.12	361.47
9	362.07	364.67	365.87	366.27	366.57	364.57	361.87	360.97	360.66	360.97	361.22	361.47
10	362.17	364.62	365.82	366.62	366.57	364.42	361.82	360.87	360.75	360.92	361.17	360.86
11	362.22	364.27	365.77	366.67	366.62	364.37	361.77	360.77	360.79	360.87	361.07	361.07
12	362.42	363.97	365.67	366.67	366.77	364.37	361.77	360.77	360.79	360.79	361.07	361.12
13	362.57	363.87	365.67	366.67	366.87	364.22	361.62	360.67	360.79	360.70	361.22	361.17
14	362.57	363.82	365.67	367.12	366.72	364.17	361.57	360.72	360.87	360.66	361.32	361.17
15	362.87	363.87	365.67	367.27	366.52	364.17	361.57	360.77	360.87	360.62	361.27	361.22
16	362.97	363.92	365.62	367.27	366.37	364.12	361.47	360.77	360.79	360.66	361.22	361.42
17	363.07	363.87	365.42	367.17	366.32	363.97	361.27	360.82	360.83	360.70	360.97	361.47
18	362.97	363.97	365.12	367.22	366.17	363.87	361.12	360.87	360.87	360.83	360.97	361.47
19	362.97	364.22	364.92	367.17	366.02	363.67	361.07	360.92	360.97	360.87	360.97	361.52
20	362.97	364.37	364.87	367.12	365.97	363.52	360.87	360.82	360.97	360.87	361.07	361.72
21	363.07	364.42	364.77	366.97	365.72	363.32	360.87	360.77	360.97	360.97	361.32	361.87
22	363.22	364.72	364.77	366.82	365.52	363.27	360.97	360.67	360.92	360.92	361.27	361.87
23	363.47	364.92	365.32	366.57	365.32	363.27	360.82	360.72	360.87	360.97	361.17	361.87
24	363.72	365.82	366.17	366.27	365.17	363.17	360.67	360.62	360.87	360.97	361.17	361.72
25	363.97	366.02	366.37	366.17	365.02	363.07	360.77	360.52	360.97	360.97	361.32	361.62
26	364.22	366.22	366.32	366.17	364.87	362.97	360.77	360.57	360.97	360.97	361.42	361.57
27	364.47	366.52	366.22	366.02	364.77	362.97	360.77	360.52	360.92	360.97	361.47	361.57
28	364.47	366.67	366.17	366.07	364.67	362.82	360.77	360.67	360.87	361.07	361.57	361.57
29	364.47	......	366.17	366.02	364.52	362.77	360.72	360.72	360.79	361.12	361.47	361.52
30	364.37	......	366.32	366.47	364.42	362.52	360.72	360.77	360.79	361.17	361.47	361.47
31	364.37	......	366.52	......	364.37	......	360.67	360.77	......	361.17	......	361.47

ONEIDA RIVER ABOVE OAK ORCHARD DAM.

Readings of the water-surface elevation above Oak Orchard dam were taken by the U. S. Geological Survey from a reference point on the lock wall, beginning August 30, 1902, as described in connection with the gagings at Schroeppel's bridge. April 23, 1904, a gage was placed on the fender piles a short distance above the entrance to the lock above Oak Orchard dam by this Department. Preceding June 5, 1907, the zero of this gage was at elevation 360.64. Beginning June 5, 1907, the datum has been at elevation 360.83. Readings are taken each morning and night by Louis McArthur. The gage is vertical and is graduated decimally by means of coppered staples.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oneida River above Oak Orchard Dam.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	364.43	366.43	367.73	367.53	367.53	366.48	365.13	364.48	364.33	363.33	365.03	364.38
2	364.58	366.28	367.68	367.53	367.58	366.43	365.08	364.33	364.33	363.28	365.13	364.43
3	364.78	366.23	367.63	367.53	367.73	366.58	365.03	364.33	364.23	363.43	365.13	364.53
4	365.03	366.23	367.48	367.53	367.68	366.63	364.93	364.33	363.88	364.18	365.18	364.43
5	365.53	366.28	367.28	367.53	367.68	366.63	364.93	364.23	363.58	364.03	365.23	364.38
6	365.38	366.23	367.13	367.53	367.83	366.63	364.88	364.23	364.08	364.03	365.18	364.23
7	365.18	366.13	367.13	367.23	367.83	366.63	364.93	364.23	364.23	364.08	365.13	364.28
8	365.23	366.18	367.13	366.78	367.68	366.58	364.88	364.23	364.33	364.33	365.13	364.43
9	365.33	366.33	366.98	367.13	367.68	366.58	364.83	364.28	364.33	364.38	365.08	364.48
10	365.38	366.18	367.08	367.53	367.73	366.58	364.78	364.23	364.48	364.63	364.93	364.53
11	365.43	366.13	367.13	368.03	367.78	366.53	364.63	364.23	364.63	364.68	364.73	364.53
12	365.48	366.18	367.03	368.03	367.93	366.48	364.33	364.18	364.58	364.43	364.88	364.53
13	365.48	366.13	367.03	368.08	367.93	366.38	364.08	364.23	364.53	364.18	365.03	364.43
14	365.53	366.13	367.03	368.33	367.78	366.23	363.78	364.33	364.48	364.08	365.03	364.38
15	365.53	366.18	367.03	368.43	367.73	366.23	363.68	364.38	364.38	364.03	365.08	364.43
16	365.53	366.13	367.03	368.33	367.68	366.23	364.03	364.43	364.48	364.03	364.53	364.43
17	365.53	366.18	366.98	368.28	367.64	366.13	363.98	364.33	364.63	364.18	364.23	364.43
18	365.48	366.23	366.78	368.23	367.53	366.13	363.98	364.33	364.63	364.63	364.13	364.43
19	365.43	366.28	366.58	368.18	367.33	366.13	363.93	364.23	364.63	364.73	363.93	364.48
20	365.33	366.33	366.63	368.13	367.23	366.13	363.98	364.28	364.58	364.83	363.93	364.53
21	365.33	366.33	366.63	367.88	367.03	365.98	364.13	364.28	364.43	364.83	363.83	364.53
22	365.58	366.43	366.63	367.78	366.88	365.78	364.18	364.23	364.23	364.93	363.78	364.48
23	365.78	366.63	366.83	367.63	366.78	365.73	364.28	364.18	363.93	364.83	363.83	364.53
24	365.98	367.13	367.33	367.53	366.73	365.63	364.48	364.23	363.58	364.88	363.93	364.43
25	366.23	367.18	367.43	367.53	366.73	365.53	364.53	364.13	363.43	364.98	363.88	364.58
26	366.58	367.38	367.38	364.88	366.58	365.53	364.53	364.18	363.83	364.93	364.08	364.63
27	366.63	367.63	367.28	367.53	366.53	365.53	364.43	364.23	363.78	364.93	364.13	364.58
28	366.63	367.73	367.28	367.48	366.48	365.48	364.53	364.23	363.73	364.93	364.23	364.53
29	366.48	......	367.38	367.33	366.43	365.28	364.63	364.08	363.63	364.98	364.38	364.53
30	366.43	......	367.53	367.33	366.43	365.23	364.63	364.08	363.63	365.03	364.43	364.43
31	366.43	......	367.58	......	366.43	......	364.53	364.33	......	365.03	......	364.43

Oneida River below Lock at Caughdenoy, N. Y.

A vertical gage was erected by this Department on the fender piles at the left-hand side of Oneida river below Caughdenoy lock, April 22, 1904. The gage is divided decimally to feet and tenths by means of coppered staples and reads from zero to nine feet. The zero mark is at elevation 363.93. Readings of this gage and also of the gage above the lock are taken each morning by Adniram Hart.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oneida River below Lock at Caughdenog, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906.												
1	364.63	367.23	369.33	369.03	369.33	367.43	365.63	364.43	363.93	363.43	365.03	364.33
2	364.73	367.03	369.23	369.03	369.33	367.43	365.43	364.43	363.53	363.23	364.93	364.43
3	364.73	366.93	369.23	369.13	369.43	367.23	365.23	364.33	363.93	363.03	364.93	364.53
4	364.83	366.83	368.93	369.03	369.53	367.23	365.13	364.23	363.93	363.03	364.83	364.43
5	365.03	366.73	368.73	369.13	369.43	367.53	365.13	364.43	363.73	363.93	364.63	364.43
6	365.63	367.13	368.83	369.23	369.43	367.43	365.13	364.23	364.13	364.23	364.53	364.03
7	365.63	366.93	368.73	369.33	369.43	367.63	365.13	363.93	364.03	363.93	364.83	364.93
8	365.43	366.93	368.53	369.53	369.33	367.63	365.03	363.93	363.93	363.83	364.83	364.03
9	365.33	367.03	368.53	369.73	369.33	367.63	365.03	364.03	364.03	364.23	364.83	363.83
10	365.53	367.53	368.43	369.83	369.33	367.63	365.03	363.73	*a*	364.53	365.03	364.03
11	365.83	367.03	368.23	369.83	369.33	367.43	365.03	363.93	364.33	364.63	364.93	364.03
12	365.83	367.03	368.43	369.93	369.53	367.43	365.03	364.03	364.03	364.43	364.83	364.43
13	365.93	366.93	368.43	370.03	369.63	367.33	364.83	364.03	364.33	363.73	364.93	364.93
14	366.03	366.93	*a*	370.03	369.53	367.23	364.53	363.93	364.43	363.73	364.93	364.33
15	365.83	366.83	368.33	370.23	369.33	367.03	364.53	364.03	364.53	363.93	365.03	364.23
16	365.83	367.03	368.33	370.43	369.43	366.93	364.73	364.43	364.33	363.43	364.83	364.33
17	366.03	366.93	368.23	370.23	369.23	366.83	364.53	365.13	364.03	363.33	364.43	364.33
18	365.83	366.93	368.03	370.13	369.13	366.63	364.23	364.33	364.03	364.03	364.03	364.43
19	365.93	367.03	367.93	370.03	369.03	366.53	363.93	364.03	364.03	364.43	363.93	364.33
20	365.83	367.03	367.83	369.73	368.93	366.53	364.43	364.03	364.53	364.53	363.93	364.53
21	365.83	367.33	367.73	369.93	368.93	366.53	363.93	363.93	364.43	365.13	363.93	364.43
22	365.73	367.63	367.73	369.63	368.73	366.53	364.23	364.03	364.63	364.43	364.53	364.43
23	365.93	367.83	367.73	369.53	368.43	366.43	364.63	364.03	364.23	364.73	363.83	364.43
24	366.33	368.53	367.73	369.33	368.23	366.43	363.83	364.03	363.73	364.53	364.03	364.43
25	366.43	368.43	368.33	369.53	368.03	366.33	363.63	364.13	363.63	364.83	364.03	364.43
26	366.53	368.93	368.13	369.23	368.03	366.23	364.23	364.23	363.73	364.93	364.13	364.43
27	366.73	369.23	368.53	369.23	367.93	366.13	364.53	364.03	363.73	364.73	364.43	364.53
28	366.73	369.43	368.73	368.63	367.83	366.03	364.33	364.13	363.63	364.73	364.43	364.43
29	366.83	......	368.73	368.93	367.63	365.93	364.33	364.33	363.73	364.63	364.13	364.43
30	367.13	......	368.83	369.83	367.53	365.83	364.33	363.93	363.63	364.83	364.33	364.43
31	367.03	......	368.83	......	367.53	......	364.03	363.93	......	365.03	......	364.43

a No record.

ONEIDA RIVER ABOVE LOCK AT CAUGHDENOY, N. Y.

This gaging station was established Aprill 22, 1904, the gage being located just above the lock at Caughdenoy. During 1908 and 1909 the eel weirs, which were formerly located at this place, were removed and a masonry dam constructed across the Oneida river. A side-cut canal extends for several hundred feet up-stream from the dam and lock. The gage is located in its former position above the lock in the side-cut canal, and accordingly it shows approximately the level of the river as it exists at the head of the side-cut several hundred feet above the dam.

During the year 1909 the conditions were arbitrarily changed from time to time, as a result of construction, which was in progress.

The zero mark of the gage is at elevation 365.31, Barge canal datum. The gage consists of a vertical board, 7⅞ x 6 inches, divided to feet and tenths by coppered staples and reading from zero to 8 feet.

Readings are taken each morning by John P. Hillyer.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oneida River above Lock at Caughdenoy, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	369.91	370.91	370.51	369.71	369.41	371.51	370.41	370.01	369.51	369.51	370.01	370.11
2	369.91	370.91	370.41	369.81	369.41	371.41	370.31	370.11	369.91	369.61	370.01	370.21
3	370.01	370.81	370.51	369.81	369.51	371.31	370.31	370.11	369.91	369.81	370.01	370.11
4	370.01	370.81	370.31	369.71	369.51	371.31	370.11	370.11	369.91	369.81	369.91	370.11
5	370.11	370.71	370.21	369.81	369.41	371.51	370.11	370.11	369.71	369.81	369.81	370.11
6	370.21	370.81	370.21	369.71	369.41	371.51	370.21	370.01	369.81	369.81	369.91	370.59
7	370.21	370.81	370.01	369.91	369.51	371.61	370.11	370.01	370.01	369.81	370.11	371.39
8	370.31	370.91	369.91	369.31	369.41	371.61	370.01	370.01	369.91	369.91	370.01	370.79
9	370.41	370.91	369.81	370.21	369.41	371.61	370.01	370.01	369.91	369.81	370.01	370.59
10	370.51	371.01	369.71	369.41	369.51	371.61	370.11	369.91	*a*	369.91	370.01	370.69
11	370.51	370.91	369.51	370.31	369.41	371.31	370.01	369.91	369.81	369.81	369.81	370.79
12	370.51	370.91	369.71	370.41	369.61	371.41	370.11	369.81	369.91	369.81	379.81	370.79
13	370.51	370.91	369.71	370.41	369.61	371.41	369.81	369.91	369.91	369.61	369.91	371.09
14	370.51	370.81	*a*	370.51	369.51	371.31	369.91	370.01	369.91	369.61	370.01	370.69
15	370.41	370.81	369.61	370.01	369.41	371.21	370.01	370.01	370.01	369.81	370.01	370.69
16	370.51	370.91	369.71	370.81	369.71	371.21	370.01	370.11	369.91	369.21	370.01	370.79
17	370.51	370.81	369.71	370.51	369.51	371.11	369.91	370.61	369.91	369.31	369.81	370.79
18	370.51	370.81	369.61	370.31	371.51	370.81	370.01	370.01	369.91	369.71	369.91	370.89
19	370.51	370.91	369.61	369.61	370.81	370.91	369.91	370.01	369.91	369.81	370.01	370.89
20	370.51	370.81	369.71	369.81	372.41	370.91	370.11	370.01	369.91	369.81	370.01	370.99
21	370.51	371.01	369.71	370.01	372.61	370.91	370.01	370.01	369.91	370.31	370.01	370.99
22	370.51	371.21	369.51	369.61	372.41	370.81	370.01	370.01	370.01	369.81	370.21	370.99
23	370.51	371.31	369.41	369.61	372.31	370.81	370.31	370.01	369.81	369.81	369.91	370.89
24	370.71	371.61	369.31	369.41	372.11	370.71	369.61	370.11	369.71	369.81	370.11	370.89
25	371.01	371.51	369.71	369.71	372.11	370.61	369.91	370.01	369.81	369.81	370.01	370.89
26	371.11	371.81	369.61	369.31	372.01	370.61	370.11	370.01	369.81	369.91	370.11	370.89
27	371.21	371.01	369.81	369.41	371.91	370.51	370.11	369.91	369.71	369.81	370.21	370.99
28	371.21	370.61	369.81	368.81	371.81	370.41	370.11	370.01	369.71	370.01	370.21	370.89
29	371.31	......	369.71	369.11	371.71	370.41	370.11	369.91	369.81	369.61	370.21	370.89
30	371.21	......	369.71	369.91	371.61	370.41	370.01	369.91	369.81	369.91	370.21	370.89
31	371.11	......	369.71	......	371.51	......	370.11	370.11	......	370.01	......	370.89

a No record.

ONEIDA RIVER AT HIGHWAY BRIDGE, BREWERTON, N. Y.

A gage is attached to the left-hand face of a square timber crib filled with stone, adjacent to the fender piles immediately upstream from the center pier of the swinging span of the highway bridge at Brewerton. This bridge is located close to the foot of Oneida lake and the gage shows very nearly the stage of the lake. The gage was erected April 22, 1904, and was read during 1909, each morning by W. M. Hubbard.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oneida River at Highway Bridge, Brewerton, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	369.58	371.38	372.48	371.98	373.18	371.48	370.18	369.88	369.58	369.38	369.68	369.88
2	369.68	371.38	372.38	372.08	373.28	371.48	370.18	369.88	369.48	369.38	369.68	369.88
3	369.68	371.38	372.28	372.18	373.38	371.48	370.08	369.78	369.58	369.38	369.68	369.88
4	369.68	371.38	372.28	372.18	373.28	371.48	370.08	369.78	369.68	369.38	369.68	369.88
5	369.68	371.38	372.18	372.28	373.18	371.48	369.98	369.78	369.98	369.38	369.68	369.88
6	369.78	371.28	372.08	372.48	373.28	371.48	370.08	369.78	369.68	369.48	369.68	369.88
7	369.88	371.28	371.98	371.88	373.28	371.58	369.98	369.68	369.58	369.48	369.68	369.98
8	369.98	371.18	371.88	372.68	373.28	371.58	369.98	369.68	369.58	369.48	369.68	369.98
9	370.08	371.18	371.78	372.78	373.18	371.58	369.98	369.58	369.58	369.48	369.68	369.88
10	370.08	371.18	371.78	372.78	373.18	371.48	369.98	369.68	369.58	369.48	369.68	369.88
11	370.08	371.28	371.78	372.88	373.18	371.38	369.88	369.68	369.58	369.48	369.68	369.88
12	370.18	371.28	371.68	372.88	373.08	371.38	369.78	369.68	369.58	369.48	369.68	369.88
13	370.38	371.28	371.68	372.88	373.08	371.28	369.78	369.68	369.58	369.48	369.68	370.18
14	370.38	371.28	371.68	372.98	373.08	371.18	369.68	369.68	369.58	369.48	369.68	369.88
15	370.48	371.28	371.58	372.68	372.98	371.08	369.68	369.88	369.68	369.48	369.68	369.88
16	370.48	371.28	371.58	373.18	372.98	371.08	369.68	369.78	369.58	369.38	369.68	369.88
17	370.48	371.28	371.58	373.58	372.98	370.98	369.58	369.78	369.58	369.38	369.68	369.88
18	370.48	371.38	371.48	373.68	372.88	370.88	369.48	369.68	369.58	369.38	369.68	369.88
19	370.48	371.38	371.38	373.68	372.88	370.58	369.58	369.68	369.68	369.48	369.68	369.78
20	370.58	371.48	371.48	373.68	372.78	370.68	369.68	369.68	369.58	369.48	369.68	369.88
21	370.58	371.68	371.28	373.88	372.68	370.68	369.68	369.68	369.58	369.58	369.58	369.88
22	370.58	371.68	371.18	373.78	372.58	370.68	369.68	369.68	369.58	370.08	369.68	369.88
23	370.58	371.98	371.18	373.48	372.48	370.58	369.78	369.68	369.58	369.48	369.68	369.88
24	370.88	372.18	371.08	373.38	372.38	370.48	369.88	369.68	369.58	369.48	369.68	369.88
25	370.78	372.28	371.08	373.38	372.18	370.48	369.88	369.68	369.48	369.58	369.78	369.88
26	370.88	372.48	371.18	373.28	372.08	370.48	369.88	369.68	369.48	369.58	369.78	369.88
27	371.08	372.48	371.18	373.18	371.88	370.48	369.88	369.58	369.48	369.58	369.88	369.88
28	371.18	372.48	371.38	373.18	371.88	370.38	369.88	369.58	369.48	369.58	369.88	369.88
29	371.28	......	371.88	373.38	371.78	370.28	369.98	369.48	369.48	369.58	369.88	369.88
30	371.28	......	371.88	373.18	371.68	370.28	369.88	369.58	369.48	369.58	369.88	369.88
31	371.38	......	371.98	......	371.58	......	369.98	369.68	......	369.58	......	369.88

FISH CREEK AT SYLVAN BEACH, N. Y.

Fish creek enters Oneida lake at the eastern end of the lake. The channel of the creek is being enlarged to serve as the entrance of the Barge canal to Oneida lake and an approach is being extended into the lake.

A gage was erected July 1, 1904, near the mouth of the creek, the readings of the gage showing lake level at this point. The position of the gage has been slightly changed at several times during Barge canal construction. The gage is vertical and consists of a ⅞ by 6-inch board, divided to feet and tenths, the lower 5-foot section being of enameled steel and the upper portion being subdivided by coppered staples.

The zero mark of the gage was at elevation 370, May 21, 1906, to October 5, 1909, when it was removed to elevation 368.0, Barge canal datum.

Readings are taken at 8 A. M. daily by William H. Dunn.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Oneida Lake at Mouth o Fish Creek at Sylvan Beach, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	370.00	371.90	373.20	372.80	373.30	371.90	370.70	370.10	369.90	369.90	370.10	370.30
2	370.10	371.90	373.20	372.80	373.60	371.80	370.60	370.10	369.90	370.00	370.10	370.40
3	370.00	371.90	373.20	372.80	373.80	371.70	370.70	370.10	369.90	370.00	370.10	370.40
4	370.00	372.00	373.20	372.90	373.80	371.60	370.50	370.10	369.90	369.90	370.10	370.30
5	370.20	372.00	373.20	373.00	373.90	371.90	370.40	370.10	370.00	369.90	370.10	370.40
6	370.30	372.00	373.20	373.00	374.00	371.90	370.40	370.10	370.00	369.90	370.10	370.40
7	370.30	372.00	372.20	373.60	373.60	371.80	370.30	370.10	370.00	369.90	370.10	370.30
8	370.30	372.00	372.20	373.65	373.40	371.80	370.20	370.10	370.00	369.90	370.10	370.40
9	370.40	372.00	372.20	373.60	373.80	371.80	372.20	370.10	370.00	369.80	370.10	370.40
10	370.50	372.00	372.20	373.60	373.80	372.00	370.20	370.10	370.00	369.80	370.10	370.40
11	370.60	371.90	372.10	373.60	374.00	371.80	370.20	370.10	370.00	369.90	370.10	370.40
12	370.60	371.90	372.10	373.60	373.80	371.80	370.20	370.00	370.00	369.90	370.10	370.30
13	370.60	371.90	372.10	373.70	373.80	371.80	370.10	370.00	370.00	369.90	370.10	369.80
14	370.60	371.90	372.10	373.80	373.70	371.80	370.10	370.00	370.00	369.90	370.10	369.90
15	370.60	371.90	372.00	374.20	373.60	371.70	370.10	370.00	370.00	369.90	370.20	370.10
16	370.60	372.00	372.00	374.20	373.00	371.60	370.10	370.00	370.00	369.95	370.10	370.40
17	370.60	372.00	372.00	374.20	373.50	371.70	370.30	370.00	370.00	370.00	370.20	370.40
18	370.60	372.00	372.00	374.30	373.40	371.60	370.20	370.00	369.90	370.00	370.40	370.40
19	370.60	372.00	372.00	374.40	373.30	371.50	370.20	370.00	369.90	370.00	370.20	370.40
20	370.60	372.00	371.00	374.40	373.20	371.50	370.10	370.00	369.90	370.00	370.20	370.40
21	370.00	372.00	371.00	374.40	373.00	371.30	370.10	370.00	369.90	370.00	370.30	370.40
22	370.60	371.90	371.00	374.50	373.00	371.10	370.10	370.00	369.80	370.10	370.30	370.40
23	370.60	372.00	371.00	374.50	373.00	371.10	370.30	370.10	369.80	370.10	373.30	370.40
24	371.20	372.00	371.10	374.50	372.90	371.00	370.30	370.10	370.00	370.10	370.20	370.40
25	371.60	372.00	371.20	374.50	372.80	371.00	370.20	370.10	370.00	370.10	370.20	370.30
26	371.70	372.00	371.60	374.50	372.70	371.00	370.10	370.10	369.80	370.10	370.20	370.30
27	371.80	372.00	371.60	374.00	372.50	370.90	370.10	370.00	369.90	370.10	370.20	370.30
28	371.90	373.20	371.60	373.80	372.20	370.80	370.10	370.00	370.00	370.10	370.30	370.30
29	371.90	......	371.60	373.60	372.10	370.80	370.10	370.00	369.80	370.10	370.30	370.30
30	371.90	......	371.90	373.20	372.00	370.70	370.10	370.00	369.90	370.10	370.30	370.30
31	371.90	......	372.40	......	371.90	......	370.10	370.00	......	370.10	......	370.30

ONEIDA CREEK.

DESCRIPTION.

The head waters of Oneida creek are in northeastern Madison county. Above Peterboro the drainage is mostly through a swamp averaging one-half mile in width by 2½ miles in length. The stream flows easterly from this swamp to the foot of the falls above Munnsville. In the vicinity of the falls the stream descends from elevation 1,100 to elevation 700 in about three miles. From Munnsville to Oneida the creek flows through a somewhat dissected valley of one mile average width, bordered by steep slopes rising 500 feet or more within a distance of one mile on either side. North of Oneida Castle the drainage is rather flat. Oneida creek enters the eastern end of Oneida lake near South Bay, the elevation of the lake being at 370. Water-power is utilized at Oneida Community and at Munnsville. A feeder dam at Oneida Castle diverts most of the low-water flow to the Erie canal through a feeder 2.9 miles long entering the canal at Durhamville. The drainage basin as a whole is irregularly pear-shaped and the upper basin is broad. The slopes are steep and the tributaries are well distributed and moderately branching. This basin is shown on the Morrisville, Oneida, Chittenango and Cazenovia sheets of the U. S. Geological Survey topographic map.

ONEIDA CREEK AT KENWOOD, N. Y.

A gaging station was established at the Oneida Community Dam and Silk Mill, June 11, 1907, by Robert E. Horton. A four foot enamelled steel gage graduated to hundredths of feet is attached to a tree on the left-hand bank of Oneida creek, 175 feet up-stream from the dam. The dam is of timber, having a crest length of 79.25 feet. The crest is nearly level and the cross-section is uniform throughout the entire length. A board gage with painted 10th-foot marks was also placed in the tail-race immediately below the silk mill. The silk mill contains one 24-inch Hercules and one 24-inch Camden water-wheel. Records are kept by Carl Hatch, showing the crest and tail-race gage readings each morning and night, together with the gate opening and number of hours run per day for each water-wheel. The elevations are referred to an assumed bench-mark consisting of a chiselled cross on the up-stream corner of the right-hand abutment of the dam.

Elevation of assumed bench-mark....................	100.00
Elevation of crest of gage zero.....................	94.01
Mean crest elevation about.........................	95.60
Tail-race gage zero	82.97

Current-meter measurements were made in the tail-race to determine the turbine discharge in 1907.

The results of gagings at this station, 1898 to 1900, inclusive, may be found in the report of State Engineer and Surveyor for 1902, supplement, pages 49–52. Additional data is given in the report for 1906, supplement, pages 138–139.

Mean Daily Discharge, Second-feet, of Oneida Creek at Kenwood, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1..................	16	126	102	171	306	92	20	*70	10	62	93	84
2..................	16	112	86	146	*200	46	11	36	14	49	80	71
3..................	*44	86	72	134	165	43	20	17	13	*109	44	66
4..................	56	126	64	*175	140	46	*81	20	12	67	20	112
5..................	86	112	94	146	126	92	50	16	*3	29	14	*140
6..................	140	294	77	188	174	*60	81	17	3	20	59	97
7..................	56	*211	*109	178	171	72	81	14	58	17	*60	68
8..................	27	112	68	165	231	47	44	*89	54	15	68	65
9..................	66	55	86	156	*211	46	33	37	34	21	56	58
10..................	*81	112	574	168	289	43	55	18	96	*55	73	61
11..................	68	74	223	*109	331	61	*81	13	29	54	80	113
12..................	41	74	186	98	289	106	50	11	*55	27	50	*140
13..................	32	50	118	108	126	*103	20	11	51	24	38	91
14..................	30	*140	*175	385	178	86	20	10	24	26	*75	164
15..................	50	126	125	343	175	62	20	*57	17	14	96	113
16..................	26	156	75	314	*125	44	25	56	17	7	34	78
17..................	*109	106	126	203	171	40	42	58	5	*42	57	73
18..................	81	86	115	*140	140	134	*50	72	3	66	47	104
19..................	32	90	117	140	146	72	50	50	*3	36	62	*140
20..................	35	821	122	126	117	*95	49	25	33	23	104	72
21..................	50	*355	*175	126	106	74	37	13	12	22	*109	53
22..................	98	321	126	112	85	43	24	*60	12	19	88	75
23..................	308	280	107	99	*211	41	84	48	24	19	51	47
24..................	*603	771	107	83	68	41	92	17	30	*68	58	45
25..................	326	386	335	*140	60	46	*81	20	53	82	95	81
26..................	224	205	440	98	68	39	64	10	*81	65	86	*81
27..................	116	233	378	71	74	*68	37	13	58	16	96	109
28..................	90	*211	*109	86	79	65	29	11	40	11	*125	50
29..................	112	......	281	68	71	38	22	*3	36	12	72	20
30..................	83	......	263	171	*157	34	22	17	71	13	63	19
31..................	*109	......	134	......	182	......	11	17	......	*3	......	15
Mean...........	104	208	167	155	160	63.6	44.7	29.9	31.7	35.3	68.4	80.8

* Indicates Sundays.

Monthly Discharge of Oneida Creek, at Kenwood, N. Y.
[Drainage area, 63 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	326	16	104	1.66	1.91
February	821	50	208	3.30	3.43
March	574	64	167	2.65	3.05
April	385	71	155	2.46	2.76
May	331	60	160	2.54	2.92
June	134	34	63.6	1.01	1.13
July	92	11	44.7	0.710	0.816
August	89	3	29.9	0.475	0.546
September	96	3	31.7	0.503	0.563
October	109	3	35.3	0.560	0.644
November	125	14	68.4	1.09	1.22
December	164	15	80.8	1.28	1.47

CHITTENANGO CREEK.

DESCRIPTION.

Chittenango creek is the principal tributary of Oneida lake from the south. It comprises three main branches: Butternut creek, Limestone creek and Chittenango creek proper. The three branches join near North Manlius. Above the junction of Butternut creek, Chittenango creek flows through an irregular dumbbell-shaped area extending in a northwest and southeast direction. This area lies chiefly in the dissected, hilly region south of the line of the New York Central railroad. The length of the basin is about 22 miles. Its width in the upper portion is 9 miles; in the middle portion, 4 miles; in the lower portion, 7 miles. The drainage basin is deeply rolling, mostly cleared and has a heavy, impervious soil with extensive sodded-meadow areas. The soil is underlaid by shale rock, often outcropping, and affording numerous springs. The stream tributaries are somewhat sparse. Marsh and swamp areas are very limited, with the exception of the Nelson swamp, about two square miles in area.

There were formerly several water-powers in use in the deep narrow valley between Chittenango falls and Chittenango. The outflow from Cazenovia lake is regulated and there is also a reservoir at Erieville. These reservoirs are used to supply the summit level of the Erie canal. The capacities of these reservoirs are given as follows in New York State Barge Canal Report for 1901, page 663:

Erieville Reservoir.

Storage capacity	318,424 cubic feet
Tributary drainage area	5.4 square miles
Water-surface	340 acres

Cazenovia Lake.

Tributary drainage area	8.7 square miles
Storage capacity	206,997 cubic feet
Water-surface	1.7 square miles

The head of the stream is near Erieville reservoir, which is formed by a dam crossing a small stream valley, formerly tributary to Chenango river through Eaton brook. Results of gagings of Chittenango creek at Bridgeport, where the stream debouches into Oneida lake, may be found in the report of the State Engineer and Surveyor for 1902, Supplement, pages 57–61. Cazenovia lake is located 10 miles below Erieville reservoir, which is at the head of the stream at elevation 1,190. From its outlet to the foot of the plateau at Erie canal crossing the stream descends 770 feet, the distance, following the general trend of the valley, being 11 miles. At Chittenango falls there occurs a precipitous descent of about 100 feet.

CHITTENANGO CREEK AT CHITTENANGO, N. Y.

A current-meter gaging station was established at Main street highway bridge in Chittenango village, May 22, 1901, by R. E. Horton, for the U. S. Geological Survey, by which it was maintained until July 9, 1905, when it was transferred to the care of this Department. Current-meter measurements have been taken and rating table made, from which the accompanying tables have been computed.

The stream at this point is entrained between parallel walls, affording a channel 50 feet wide, over which the bridge passes at a single span. The bridge stands at an angle to the thread of the stream, and has a span between abutments of 57 feet. The gage board is secured in a vertical position to the right abutment on the up-stream side, and reads decimally from 0 to 8 feet. The stage of the stream is observed twice daily by the gage-reader, Bessie M. Kellogg. The bench-mark is on the up-stream corner of the coping of the right-hand bridge abutment.

Elevation, bench-mark	458.39
Elevation, gage zero	450.16

The gaging station is one-half mile above the State dam, diverting water for the supply of the summit level of Erie canal. The freshet of December 15, 1901, changed the cross-section of the stream at the gaging station. Separate rating curves have been prepared for the periods preceding and following that date.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Chittenango Creek at Chittenango, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	451.41	451.96	451.91	452.51	452.76	451.71	451.26	451.41	451.31	451.51	451.51	451.41
2	451 46	451.96	452.01	452.51	452.71	451.71	451.36	451.41	451.51	451.56	451.51	451.36
3	451.41	451.86	452.01	452.66	452.41	451.66	451.46	451.46	451.56	451.51	451.61	451.26
4	451 41	451.81	451.96	452.56	452.21	451.71	451.36	451.41	451.46	451.66	451.61	451.31
5	451.61	452.46	452.01	452.46	452.26	452.11	451.26	451.41	451.51	451.61	451.51	451.31
6	451.56	452 61	452.21	453.06	452.51	451.91	451.31	451.51	451.46	451.46	451.51	451.41
7	451.51	451.66	452.11	453.26	452.61	451.81	451.21	451.41	451.36	451.51	451.51	451.51
8	451.51	451.71	452.01	452.81	452.51	451.71	451.41	451.41	451.26	451.46	451.46	451.61
9	451.51	452.01	452.11	452.51	452 41	451.76	451.51	451.36	451.31	451.51	451.41	451.51
10	451.51	451.26	452.31	452.31	452.66	452.01	451.41	451.41	451.51	451.51	451.51	451.56
11	451.51	452.06	452.96	452.21	452.81	451.91	451.31	451.46	451.51	451.56	451.61	451.51
12	451.56	451.81	452.81	452.21	452.76	451.76	451.21	451.41	451.46	451.61	451.56	451.41
13	451.46	451.61	452.36	452.31	452.41	451.71	451.11	451.26	451.41	451.56	451.51	151 56
14	451.51	451.81	452.21	453.61	452.41	451.71	451.21	451.51	451.36	451.51	451.41	151.61
15	451.46	452 26	452.11	452.86	452.31	451.86	451.11	451.56	451.41	451.61	451.51	151.46
16	451.51	452.21	452.11	452.66	452.46	452.61	451.31	451.61	451.56	451.61	451.46	151.41
17	451.51	452.06	451.96	452.56	452.31	452.06	451.41	451.66	451.41	451.56	451.41	151.41
18	451.51	451.96	451.86	452 51	452.21	451.71	451.46	451.51	451.36	451.61	451.36	151.46
19	451.56	452.21	451.91	452.31	452.01	451.61	451.51	451.71	451.26	451.66	451.26	151.56
20	451.51	453.91	451.96	452.36	452.01	451.61	451.41	451.56	451.36	451.61	451.31	151.46
21	451.56	451 91	451.96	452.31	451.91	451.66	451.51	451.61	451.26	451.61	451.41	151.51
22	452.31	451.56	451.81	452.26	451.86	451.56	451.56	451.46	461.31	451.61	451.61	151.56
23	452.41	454.01	451 86	452.21	451.86	451.66	451.71	451.31	451.31	451.66	451.71	151.66
24	452.36	453.06	451.96	452.11	451.76	451.61	451.66	451.41	451.71	451.51	451.51	151.51
25	452 26	452.31	453.46	452.01	451.71	451.61	451.71	451.61	451.61	451.51	451.46	151.46
26	452.26	452.06	453.31	452.01	451.81	451.56	451.61	451.31	451.56	451.46	451.51	151.41
27	451.71	452.01	452.66	451.96	451.71	451.61	451.56	451.36	451.51	451.56	451.51	151.61
28	451.91	452.21	452.61	451.81	451.96	451.61	451.46	451.36	451.46	451.51	451.56	151.81
29	451.86	......	452.56	451.76	451.91	451.51	451.41	451.41	451.51	451.61	451.41	152.01
30	451.76	......	452 31	452.16	451.76	451.36	451.41	451.36	451.56	451.41	451.41	151.91
31	451.91	......	452.31	......	451.81	......	451.46	451.36	......	451.46	......	151.86

Current-meter Discharge Measurements of Chittenango Creek at Chittenango, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
May 13....	A. R. Patchke....................	2.24	124	2.30	285
July 30....	E. C. Niles........................	1.40	70.4	0.697	49.1
Aug. 27....	E. C. Niles........................	1.50	74.5	0.917	68.3

Rating Table for Chittenango Creek at Chittenango, N. Y., for 1909.

Gage height.	Discharge.	Difference.	Gage height.	Discharge.	Difference.	Gage height.	Discharge.	Difference.	Gage height.	Discharge.	Difference.
1.00	30	5	1.90	135	20	2.80	440	45	3.70	910	60
1.10	35	5	2.00	155	25	2.90	485	45	3.80	970	65
1.20	40	10	2.10	180	30	3.00	530	50	3.90	1,035	65
1.30	50	10	2.20	210	30	3.10	580	50	4.00	1,100	70
1.40	60	10	2.30	240	35	3.20	630	50	4.10	1,170	70
1.50	70	15	2.40	275	40	3.30	680	55	4.20	1,240	70
1.60	85	15	2.50	315	40	3.40	735	55			
1.70	100	15	2.60	355	40	3.50	790	60			
1.80	115	20	2.70	395	45	3.60	850	60			

Mean Daily Discharge, Second-feet, of Chittenango Creek at Chittenango, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1................	45	115	108	258	355	78	35	45	38	5	55	45
2................	50	115	125	258	335	78	40	45	55	60	55	40
3................	45	100	125	315	225	70	50	50	60	55	65	35
4................	45	92	115	275	168	78	40	45	50	70	65	38
5................	65	240	125	240	180	145	35	45	55	65	55	38
6................	60	295	168	485	258	108	38	55	50	60	55	45
7................	55	70	145	580	295	92	32	45	40	55	55	55
8................	55	78	125	375	258	78	45	35	35	50	50	65
9................	55	125	145	258	225	85	55	40	38	55	45	55
10................	55	35	195	195	315	125	45	45	55	55	55	60
11................	55	135	440	168	375	108	38	50	55	60	65	55
12................	60	92	375	168	355	85	32	45	50	65	60	45
13................	50	65	210	195	225	78	28	35	45	60	55	60
14................	55	92	168	762	225	78	32	55	40	55	45	65
15................	50	180	145	395	195	100	28	60	45	65	55	50
16................	55	168	145	315	240	295	38	65	60	65	50	45
17................	55	135	115	275	195	135	45	70	45	60	45	45
18................	55	115	100	258	168	78	50	55	40	65	40	50
19................	60	168	108	195	125	65	55	78	35	70	35	60
20................	55	940	115	210	125	65	45	60	40	65	38	50
21................	60	108	115	195	108	70	55	65	35	65	45	55
22................	195	60	92	180	100	60	60	50	38	65	65	60
23................	225	1,002	100	168	100	70	78	38	38	70	78	70
24................	210	485	115	145	85	65	70	45	78	55	55	55
25................	180	195	681	125	78	65	78	65	55	55	50	50
26................	180	135	605	125	92	60	65	38	60	50	55	45
27................	78	125	315	115	78	65	60	40	55	60	55	65
28................	108	168	295	92	115	65	50	40	50	55	60	92
29................	100	......	275	85	108	55	45	45	55	65	45	125
30................	85	......	195	155	85	40	45	40	60	45	45	108
31................	108	......	195	......	92	......	50	40	......	50	......	100
Mean...........	84.2	201	203	252	190	88.0	47.2	49.6	48.8	59.5	53.2	58.9

Monthly Discharge of Chittenango Creek, at Chittenango, N. Y.
[Drainage area, 79 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	225	45	84.2	1.07	1.23
February	1,002	35	201.	2.54	2.64
March	680	92	203.	2.57	2.96
April	762	85	252.	3.19	3.57
May	375	78	190.	2.41	2.77
June	295	40	88.0	1.11	1.24
July	78	28	47.2	0.597	0.687
August	78	35	49.6	0.628	0.722
September	78	35	48.8	0.618	0.692
October	70	45	59.5	0.753	0.866
November	78	35	53.2	0.673	0.754
December	125	35	58.9	0.746	0.858

LIMESTONE CREEK.

DESCRIPTION.

The natural source of Limestone creek is on the slope of Tinselor hills near Erieville, Madison county, N. Y. In the construction of the Chenango canal, Tioughnioga creek was diverted and DeRuyter reservoir receives the drainage tributary to this stream above the point of diversion and also that from additional area tributary to Limestone creek, making a total area above the reservoir outlet of 18.8 square miles. The reservoir has a capacity of 504,468,000 cubic feet, and a surface area of about 1.0 square mile. The stored waters are discharged through Limestone creek during the canal navigation season. Water is diverted to a feeder by a dam below Manlius. The feeder is used as a water-power canal to supply several mills at Fayetteville, at which place there is a second diverting dam. The feeder enters Erie canal 1.2 miles below Fayetteville. Power is also developed on Limestone creek at Manlius and Edwards Falls. The head waters of Limestone creek are at elevation 1,900 feet.. DeRuyter reservoir is at elevation 1,286 feet. The fall of the stream is rapid in the first three miles below the reservoir, the elevation at the lower end of this reach at Delphi being 900 feet. From Delphi to Buellville the creek follows a winding course over a flat valley bottom averaging about one-half mile in width. The descent in 8 miles between these points is 150 feet. Between Buellville and Manlius, a distance of two miles, a fall of 200 feet occurs. This is mostly concentrated at Edwards Falls, The west or Watervale branch of Limestone creek joins the main stream below Manlius. The precipitous descent of about 100 feet in a short distance occurs at this branch at stone quarry falls. The drainage basin is shown on the Syracuse, Tully, Chittenango and Cazenovia sheets of the United States Geological Survey topogrophic map.

LIMESTONE CREEK AT FAYETTEVILLE, N. Y.

This gaging station, which is located above the State dam at the head of the Erie canal feeder in Fayetteville, was established August 27, 1905, by C. A. Poole.

The gage is a vertical board, graduated in feet and tenths, and is secured to retaining wall on south side of gates at entrance to feeder, about 55 feet above crest of dam. The elevation of zero of gage is 429.53. The elevation of bench-mark on east end of north retaining wall of feeder, 42 feet east of gates, is 434.74. Observations are taken twice daily by C. B. Dunlop.

The dam is of masonry and in good condition, having been rebuilt in 1897. It is of trapezoidal shape with an approach slope of 1 on 6 and vertical down-stream face. The length of crest is 99.1 feet at an average elevation of 431.18. The discharge over the dam has been calculated by means of the weir formula, using coëfficients derived from the Cornell University experiments made in 1898.

The flow in the feeder is controlled by gateways at entrance. There are four openings in the bulkhead, which are regulated by means of drop planks.

A gage was temporarily maintained in the canal feeder at Fayetteville, but the fluctation was so slight that it has been discontinued.

Water is also diverted through the cement mill on east side of creek. Current-meter measurements were formerly made in the raceway to mill, and in the canal feeder. The freshet discharge of the stream can be determined at this site, but a separate gaging station was established at Manlius in July, 1907, to determine the low-water flow.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Limestone Creek above Dam at Fayetteville, N. Y.

DAY.	Jan.	1.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	431.73	431.83	432.58	432.58	431.68	431.58	430.88	430.58	430.33	430.43	430.63	431.33
2	431.68	431.73	432.43	432.53	431.78	431.53	430.78	430.48	430.38	430.48	430.53	431.33
3	431.78	431.78	432.43	432.48	431.73	431.63	430.83	430.53	430.23	430.33	430.48	431.23
4	431.88	431.73	432.48	432.48	431.58	431.48	430.78	430.38	430.18	430.18	430.33	431.28
5	431.88	431.93	432.33	432.33	431.48	431.78	430.78	430.48	430.38	430.08	430.28	431.28
6	432.33	432.28	432.48	432.38	431.73	431.78	430.68	430.28	430.38	430.28	430.23	431.23
7	432.13	432.03	432.28	432.68	431.78	431.63	430.73	430.08	430.43	430.43	430.28	431.38
8	431.93	431.88	432.38	432.43	431.58	431.53	430.53	429.88	430.48	430.58	430.28	431.43
9	431.98	431.78	432.53	432.38	431.78	431.43	430.68	429.73	430.58	430.58	430.18	431.43
10	432.08	431.88	432.68	432.28	431.53	431.53	430.98	429.83	430.68	430.68	430.28	431.53
11	432.33	431.83	432.93	432.23	431.88	431.48	431.28	429.88	430.73	430.73	430.18	431.53
12	432.13	431.78	432.43	432.13	431.68	431.48	431.33	429.78	430.83	430.88	430.23	431.53
13	432.08	431.93	432.33	432.08	431.63	431.33	430.98	429.83	430.78	430.98	430.08	431.53
14	431.98	431.78	432.18	432.48	431.58	431.43	430.78	429.78	430.78	430.93	430.03	431.78
15	431.93	431.83	432.18	432.38	431.78	431.33	430.68	429.78	430.73	430.98	430.13	431.93
16	431.93	431.93	432.08	432.03	431.83	431.33	430.53	429.88	430.93	430.83	430.18	431.88
17	431.83	431.78	432.08	431.88	431.53	431.28	430.78	430.23	430.83	430.78	430.38	431.78
18	431.83	431.73	432.18	431.83	431.63	431.53	430.88	430.43	430.78	430.68	430.68	431.73
19	431.73	431.88	432.13	431.88	431.78	431.38	430.98	430.58	430.88	430.43	430.93	431.73
20	431.73	433.63	432.23	432.03	431.68	431.28	430.78	430.63	430.93	430.38	430.98	431.68
21	431.63	433.28	432.18	431.98	431.73	431.33	430.63	430.68	430.88	430.33	431.23	431.63
22	431.73	432.68	432.08	431.83	431.78	431.28	430.38	430.58	430.88	430.43	431.38	431.63
23	432.08	432.98	432.08	431.68	431.68	431.13	430.48	430.68	430.88	430.33	431.33	431.63
24	432.48	433.43	432.03	431.58	431.73	431.23	430.93	430.58	431.18	430.38	431.28	431.63
25	432.33	433.13	432.63	431.58	431.83	431.03	430.88	430.48	431.03	430.48	431.33	431.63
26	432.33	432.78	432.83	431.73	431.73	430.98	430.78	430.63	430.88	430.68	431.28	431.63
27	432.13	432.78	432.78	431.78	431.53	431.08	430.73	430.58	430.78	429.59	431.18	431.63
28	431.98	432.68	432.73	431.58	431.68	431.03	430.68	430.48	430.68	430.03	431.28	431.63
29	431.93	......	432.68	431.53	431.68	430.98	430.48	430.38	430.48	430.38	431.38	431.63
30	431.93	......	432.73	431.73	431.73	430.93	430.58	430.28	430.63	430.63	431.43	431.63
31	431.93	......	432.63	......	431.58	......	430.48	430.23	......	430.58	......	431.63

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Limestone Creek Feeder at Fayetteville, N. Y.

DAY.	Jan.*a*	Feb.*a*	Mar.*a*	April.*a*	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.*a*
1909.												
1	......	......	......	......	*a*	429.17	429.07	429.02	428.97	428.87	428.97	......
2	......	......	......	......	*a*	429.12	428.97	429.07	429.02	429.02	429.07	......
3	......	......	......	......	*a*	429.17	429.07	428.92	428.92	428.97	429.07	......
4	......	......	......	......	*a*	429.07	428.92	428.92	428.92	428.97	429.02	......
5	......	......	......	......	*a*	429.22	428.92	429.02	428.97	428.92	428.92	......
6	......	......	......	......	*a*	249.12	429.02	428.72	428.92	429.02	429.02	......
7	......	......	......	......	*a*	429.07	428.97	428.67	428.97	429.07	428.97	......
8	......	......	......	......	*a*	429.07	428.87	428.67	428.87	429.02	429.02	......
9	......	......	......	......	*a*	429.02	429.02	428.62	428.97	429.07	429.07	......
10	......	......	......	......	*a*	429.17	429.07	428.67	429.07	429.02	429.07	......
11	......	......	......	......	*a*	429.12	428.97	428.72	429.07	429.07	428.97	......
12	......	......	......	......	*a*	429.07	428.97	428.67	429.07	429.07	428.92	......
13	......	......	......	......	*a*	429.12	428.87	428.77	429.07	429.07	428.87	......
14	......	......	......	......	*a*	429.17	428.82	428.77	429.02	429.02	428.87	......
15	......	......	......	......	428.87	429.07	428.87	428.82	429.07	429.07	428.97	......
16	......	......	......	......	429.17	429.12	428.92	428.87	429.12	428.87	428.87	......
17	......	......	......	......	429.27	429.17	429.02	428.92	429.07	428.92	428.77	......
18	......	......	......	......	429.32	429.27	429.07	429.02	429.02	428.97	427.57	......
19	......	......	......	......	429.27	429.12	429.07	429.07	429.07	428.87	*a*	......
20	......	......	......	......	429.22	429.07	429.02	429.02	429.07	428.97	*a*	......
21	......	......	......	......	429.22	429.07	429.02	429.07	429.12	428.92	*a*	......
22	......	......	......	......	429.12	429.02	428.92	429.02	429.07	428.97	*a*	......
23	......	......	......	......	429.12	428.97	428.97	429.07	429.02	428.92	*a*	......
24	......	......	......	......	429.07	429.07	429.02	428.97	429.12	428.97	*a*	......
25	......	......	......	......	429.17	429.07	429.07	429.02	429.07	429.02	*a*	......
26	......	......	......	......	429.07	429.02	429.02	429.07	428.97	429.07	*a*	......
27	......	......	......	......	429.07	429.07	429.07	429.07	428.97	429.07	*a*	......
28	......	......	......	......	429.17	429.12	429.07	428.97	428.92	429.07	*a*	......
29	......	......	......	......	429.17	429.17	429.02	428.87	428.87	429.02	*a*	......
30	......	......	......	......	429.12	429.12	429.07	428.82	428.92	429.07	*a*	......
31	......	......	......	......	429.17	......	429.02	428.87	......	429.07	......	......

a Navigation closed, water drawn out of feeder.

LIMESTONE CREEK AT MANLIUS, N. Y.

A gaging station was established July 23, 1907, by Robert E. Horton, for this Department, at Wilcox avenue bridge in Manlius. The gage consists of a triangular box containing a scale graduated to tenths from zero to 7.4, and a chain and weight by which the readings are taken. The gage is attached to the bottom chord on the down-stream side of the bridge. The length of the chain and weight is 14.00 feet. Readings are taken by John Carroll at 7 A. M. and 6 P. M. each day. Current-meter measurements are made from the down-stream side of the bridge, starting at the face of the left-hand abutment as an initial point. The bridge is subdivided into 2.5-foot sections for purposes of measurement. The span is 73 feet.

Mean Daily Gage Height, in Feet, of Limestone Creek at Wilcox Avenue Bridge, Manlius, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	2.12	2.80	4.20	3.65	3.75	2.98	2.38	2.60	2.45	2.58	2.72	2.68
2	2.25	2.58	4.02	3.62	3.75	3.05	2.35	2.35	2.60	2.75	2.68	2.58
3	2.28	2.72	3.45	3.68	3.72	3.00	2.55	2.45	2.35	2.70	2.65	2.52
4	2.30	2.85	3.20	3.65	3.70	3.20	2.65	2.10	2.48	2.70	2.72	2.62
5	2.40	3.52	3.10	3.70	3.52	3.10	2.35	2.30	2.75	2.78	2.72	2.60
6	3.00	3.80	3.10	2.82	3.70	3.10	2.50	2.48	2.68	2.62	2.62	2.62
7	2.82	3.45	3.20	3.42	3.95	3.22	2.38	2.32	2.45	2.75	2.70	2.72
8	2.70	3.48	3.10	3.38	3.70	3.10	2.60	2.60	2.58	2.78	2.65	2.60
9	2.22	3.35	3.00	3.40	3.70	2.95	2.50	2.70	2.60	2.78	2.68	2.58
10	2.48	3.60	2.98	3.42	3.68	2.90	2.62	2.65	2.72	2.72	2.58	2.58
11	2.52	3.45	3.05	3.55	3.65	2.95	2.58	2.38	2.55	2.62	2.65	2.70
12	2.40	3.32	2.95	3.28	3.80	2.78	2.68	2.45	2.52	2.82	2.60	2.58
13	2.58	3.10	2.45	3.35	3.65	2.90	2.50	2.42	2.68	2.78	2.58	2.88
14	2.58	2.80	3.10	3.75	3.78	2.78	2.48	2.20	2.58	2.62	2.70	2.65
15	2.60	3.50	3.30	3.60	3.68	3.00	2.38	2.62	2.55	2.58	2.68	3.00
16	2.78	3.70	3.15	3.65	3.78	3.05	2.50	2.42	2.60	2.68	2.52	2.72
17	2.75	3.05	3.28	3.48	3.65	2.55	2.38	2.75	2.58	2.65	2.68	2.70
18	2.75	2.82	3.65	2.72	3.68	3.02	2.58	2.58	2.58	2.58	2.48	2.72
19	2.75	2.88	3.42	2.90	3.55	3.00	2.42	2.60	2.72	2.78	2.52	2.62
20	2.72	5.00	3.28	3.22	3.40	3.02	2.75	2.72	2.55	2.60	2.72	2.52
21	2.72	4.68	3.00	3.32	3.50	2.78	2.52	2.72	2.68	2.72	2.60	2.38
22	2.65	4.30	3.08	3.40	3.08	2.80	2.42	2.70	2.72	2.82	2.65	2.42
23	2.90	4.45	3.25	3.32	3.10	2.60	2.70	2.55	2.52	2.58	2.40	2.55
24	3.95	4.98	3.45	3.35	3.12	2.72	2.80	2.55	2.02	2.68	2.40	2.35
25	3.52	4.52	3.60	3.42	3.00	2.60	2.62	2.52	2.65	2.68	2.55	2.52
26	3.40	4.65	3.80	3.40	2.85	2.78	2.48	2.42	2.75	2.65	2.55	2.48
27	3.32	4.20	3.95	3.45	3.00	2.60	2.68	2.55	2.60	2.58	2.40	2.62
28	2.72	4.20	3.80	3.32	3.05	2.48	2.60	2.40	2.55	2.68	2.55	2.75
29	2.80	......	3.18	3.62	3.05	2.25	2.50	2.52	2.62	2.70	2.45	2.62
30	2.95	......	2.70	3.68	3.02	2.15	2.52	2.35	2.52	2.65	2.50	2.75
31	2.70	......	2.98	......	3.10	......	2.65	2.65	......	2.72	......	2.75

Current-meter Discharge Measurements of Limestone Creek at Manlius, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
Feb. 11....	Clark and Gehring..................	2.9	35.4	3.14	111
July 29....	E. C. Niles..........................	2.5	31.9	1.98	63.1
Aug. 26....	E. C. Niles..........................	2.55	31.1	2.02	62.7
Oct. 27....	A. R. Patchke......................	2.52	28.1	1.70	47.8

BUTTERNUT CREEK.

DESCRIPTION.

The head waters of Butternut creek lie at elevation 1,700 feet, near the south line of Onondaga county. This stream drains a narrow basin about 24 miles in length and having an average width of about 3 miles. The stream flows in a southerly direction. Jamesville reservoir is located 14 miles below the source at elevation about 640. North of Erie canal the stream flows out into the flat lands, at elevation about 400, which border Oneida lake for a width of several miles. Butternut creek is joined by Limestone creek near North Manlius at a point about 1½ miles above its junction with Chittenango creek. Erie canal crosses the stream 4½ miles below Jamesville. Above Erie canal crossing the slopes are steep and the tributaries are mostly short laterals. Jamesville reservoir has a capacity of 170,000,000 cubic feet. The water-surface area is 252 acres. At a distance of 2.35 miles below Jamesville is a dam which diverts part of the stream to the Orrville feeder. This feeder is 2.25 miles in length.

BUTTERNUT CREEK NEAR JAMESVILLE, N. Y.

A gaging station was established on Butternut creek at the first bridge above the head of the Orrville feeder, July 25, 1907, by Robert E. Horton, for this Department. The gage is located about 2 miles below Jamesville, and measurements at this point will show the supply to the canal available from Jamesville reservoir and the Orrville feeder. A box-and-chain gage is bolted to the hand-rail of the bridge on the up-stream side. The gage scale reads from zero to 7.5 feet, and the length of the chain is 13.00. The current-meter measurements are made from the down-stream side of the bridge, using the face of the right-hand abutments as an initial point. The bridge is subdivided at two-foot intervals and the span is 40 feet. The gage is read at 7 A. M. and 6 P. M. by Marie Brandt.

Mean Daily Gage Height, in Feet, of Butternut Creek near Jamesville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1.00	1.00	2.80	3.20	2.60	0.50	0.20	1.00	2.00	1.05	0.95	0.90
2	1.00	1.00	2.40	3.40	2.40	0.40	0.20	1.00	2.00	1.00	1.00	0.90
3	0.90	1.40	2.25	3.55	2.40	0.40	0.20	1.00	2.00	1.05	1.00	0.85
4	0.90	1.40	2.00	3.15	2.40	0.30	0.20	1.00	2.00	1.15	1.00	0.85
5	0.80	1.50	2.00	3.25	2.15	0.30	0.20	1.10	2.00	1.15	1.00	0.75
6	0.80	1.40	2.00	3.35	2.10	0.40	0.20	1.10	2.10	1.10	0.85	0.75
7	0.80	1.30	2.10	3.35	2.20	0.35	0.10	1.10	2.20	1.00	0.85	0.75
8	0.80	1.00	2.30	3.35	2.40	0.35	0.10	1.00	2.05	1.00	0.90	0.70
9	1.50	1.00	2.40	3.15	2.25	0.45	0.10	1.00	2.00	1.00	0.90	0.70
10	1.50	0.90	2.35	3.00	2.10	0.45	0.10	1.00	2.00	1.00	0.90	0.60
11	1.40	0.90	2.50	2.45	2.15	0.55	0.10	1.00	2.00	1.00	0.90	0.55
12	1.40	0.90	2.70	1.75	2.15	0.55	0.15	1.00	1.90	1.30	1.00	0.60
13	1.50	0.95	2.90	1.60	2.00	0.45	0.20	1.10	1.85	1.20	0.95	0.70
14	1.30	1.00	2.15	1.55	1.90	0.35	0.20	1.10	1.85	1.20	1.00	0.90
15	1.30	0.90	2.15	1.55	1.90	0.35	0.10	1.00	1.85	1.25	1.10	0.80
16	1.20	0.80	2.00	1.60	1.80	0.30	0.10	1.00	1.95	1.20	1.20	0.80
17	1.00	0.80	2.00	1.50	1.90	0.30	0.10	1.00	2.00	1.15	1.10	0.80
18	0.95	0.90	2.15	1.95	1.95	0.25	0.10	1.05	2.00	1.10	1.10	0.80
19	0.90	1.75	2.45	1.95	1.90	0.25	0.55	1.20	1.00	1.10	1.00	0.90
20	1.20	1.90	2.90	1.85	1.90	0.15	1.00	1.20	1.55	1.00	1.00	0.95
21	1.35	3.00	2.90	1.80	1.75	0.20	1.00	1.20	1.35	1.05	1.00	1.05
22	1.40	3.15	2.00	1.70	1.75	0.15	1.00	1.20	1.15	1.05	1.00	1.10
23	1.50	3.20	2.05	1.55	0.65	0.15	1.10	1.20	1.10	1.00	1.00	1.30
24	1.40	3.50	2.00	1.85	0.65	0.10	1.25	1.25	1.10	1.00	1.00	1.30
25	1.30	3.30	2.20	1.90	0.70	0.10	1.30	1.30	1.10	0.85	1.00	1.45
26	1.10	3.45	2.25	2.00	0.70	0.10	1.25	1.50	1.10	0.80	0.90	1.25
27	1.10	3.00	3.10	2.00	0.75	0.10	1.20	1.35	1.10	0.80	0.90	1.20
28	1.05	3.00	3.00	2.15	0.85	0.10	1.20	1.30	1.05	0.75	1.00	1.20
29	1.00	......	3.00	2.75	0.85	0.10	1.10	1.30	1.05	0.75	1.00	1.20
30	1.00	......	3.40	2.80	0.65	0.10	1.10	1.30	1.05	0.75	0.90	1.20
31	1.00	......	3.50	......	0.60	......	1.20	1.30	......	0.70	......	1.30

Current-meter Discharge Measurements of Butternut Creek near Jamesville, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
Feb. 11	Clark and Gehring	1.65	39.4	1.60	63
May 13	A. R. Patchke	1.94	51.3	2.03	104
July 29	E. C. Niles	1.35	28.3	1.17	33.1
Aug. 26	E. C. Niles	1.60	37.7	1.54	58.2
Oct. 27	A. R. Patchke	1.33	27.6	1.29	35.5

GAGES ON SENECA RIVER.

Seneca river receives the drainage from the central group of lakes lying southward from Lake Ontario. The drainage basin is rolling, though not precipitous, excepting for the deep, narrow valleys crossing it, in which the lakes are situated, and certain additional valleys not at the present time occupied by lakes.

Gages have been maintained on Seneca river and its main tributaries during 1909 at the places named in the following table:

STREAM.	Location	DISTANCE IN MILES FROM—		Present type of gage.
		Three River Point.	Station to station.	
Seneca river.....	Three River Point *a*	0	0	Board with coppered staples.
Seneca river.....	Gascon reef......................................	.9	.9	Board with coppered staples.
Seneca river.....	Belgium (new bridge)............................	1.9	1.0	Chain and plumb-bob.
Seneca river.....	Mud lock (foot of Onandaga outlet)	7.0	5.1	Board with coppered staples.
Onondaga outlet.	Foot of Lake, Long Branch.........................	7.9	.9	Board with coppered staples.
Onondaga lake...	Near Iron pier--head of lake—Syracuse............	12.5	4.6	Reference point.
Seneca river ..	Below dam, Baldwinsville..........................	12.4	5.4*b*	Chain and plumb-bob.
Seneca river.....	Above dam, Baldwinsville..........................	12.5	0.1	Galvanized staple gage.
Seneca river.....	Below Jack's reef, Eel weir........................	20.8	8.3	Board with coppered staples
Seneca river.....	Above Jack's reef, State ditch	23.2	2.4	Board with coppered staples.
Seneca river.....	Bonta's bridge, 1 mile west of Cross lake	26.4	3.2	Board with coppered staples
Seneca river.....	Mosquito point bridge	35.6	9.2	Board with coppered staples.
Seneca river.....	N. Y. C. & H. R. R. bridge, 1½ miles west of Fox Ridge.	40.8	5.2	Chain and plumb-bob.
Seneca river.....	West Mud lock, foot of Cayuga lake...............	49.0	8.2	Board with coppered staples.
Clyde river......	Clyde..	56.4*c*	15.6*c*	Chain and plumb-bob.
Clyde river......	Lyons..	67.6	11.2	Chain and plumb-bob.
Ganargua creek..	2 miles west of Newark..........................	76.3	8.7	Chain and plumb-bob.
Ganargua creek..	2½ miles east of Palmyra (Harrison mill)...........	81.0	4.7	Board gage.

a Gage on Oneida river highway bridge.
b Continuing on Seneca river.
c Leaving Seneca river at mouth of Clyde river near Montezuma 45.8 miles from Three River Point.

SENECA RIVER AT HEAD OF GASCON REEF NEAR BELGIUM, N. Y.

A gage was established at the head of Gascon reef, about one-half mile north of Belgium, N. Y., April 16, 1904, by this Department. The gage is vertical and consists of a board graduated from zero to 8 feet, attached to the down-stream end of the right-hand face of the wall of a culvert under the towing-path on the right-hand bank of Seneca river about midlength of the breakwater at Gascon reef. The zero of the gage is at elevation 360.31, and readings are taken each morning by Solomon Walts.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River at Head of Gascon Reef, near Belgium, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	360.31	362.91	360.81	365.01	364.71	363.51	361.81	360.31	360.31	360.31	360.21	361.11
2	360.91	362.61	365.21	365.01	365.11	363.41	361.71	361.90	360.31	360.91	361.01	361.11
3	361.01	362.81	365.11	365.01	360.81	363.21	361.71	360.31	360.31	360.31	360.81	361.01
4	360.91	362.71	365.11	365.01	365.11	363.11	361.71	360.31	360.31	361.11	360.81	360.91
5	360.81	362.41	365.11	364.91	365.11	363.21	361.71	360.81	360.91	360.91	360.81	360.41
6	361.41	362.61	364.91	364.91	365.11	360.61	361.61	360.91	360.81	360.81	360.61	361.11
7	361.81	362.91	364.71	364.81	365.21	363.41	360.41	360.71	360.31	360.31	360.91	360.91
8	361.61	363.21	364.61	364.81	360.81	360.61	360.41	360.31	360.31	360.31	361.21	360.91
9	361.51	363.21	364.51	364.91	360.81	363.21	361.21	360.91	360.81	360.31	361.01	360.91
10	361.71	360.61	364.41	364.81	365.41	363.21	361.21	360.31	360.81	360.31	361.21	360.31
11	362.01	360.61	360.71	364.91	360.81	363.11	361.21	360.31	360.81	361.11	361.21	360.41
12	361.91	363.01	364.51	365.01	360.81	363.11	361.11	360.81	361.01	360.91	361.21	360.61
13	362.11	362.91	364.81	365.11	360.81	363.21	361.11	360.31	361.01	360.31	361.11	360.81
14	362.01	362.81	364.81	365.21	365.21	363.11	361.01	360.31	360.81	360.31	361.21	360.81
15	362.01	362.71	364.91	365.61	365.11	362.91	360.81	360.71	360.31	360.31	360.41	360.91
16	362.01	362.71	364.71	365.81	365.21	362.81	360.81	360.91	360.81	360.31	360.41	360.81
17	362.11	362.81	364.51	366.01	360.81	362.81	360.81	360.81	360.31	360.31	361.41	360.81
18	362.11	362.81	364.41	366.01	365.21	362.71	360.71	360.31	360.81	360.81	360.41	360.71
19	361.91	362.61	360.71	366.01	365.01	362.71	361.21	360.81	360.91	360.31	361.21	360.91
20	361.81	363.01	364.11	365.91	364.81	362.81	360.31	360.31	361.01	360.31	361.21	360.81
21	361.81	360.61	364.01	365.61	364.71	362.71	360.31	360.31	360.91	360.31	361.41	360.81
22	361.61	363.61	363.91	360.81	364.61	362.51	360.91	360.81	360.91	360.31	361.41	361.01
23	361.71	363.41	363.71	360.81	360.71	362.51	361.01	360.91	360.91	360.31	361.41	360.91
24	362.61	364.61	363.81	360.81	364.21	362.51	361.21	360.81	360.91	360.31	361.51	360.81
25	362.61	360.81	363.61	365.01	364.11	362.41	361.21	360.31	360.91	360.81	361.21	360.81
26	362.61	365.21	364.91	364.81	363.91	360.51	361.11	360.31	360.81	360.31	361.01	361.11
27	362.91	365.41	365.21	364.61	363.81	362.21	361.01	360.31	361.11	360.31	361.21	361.21
28	362.91	360.81	365.01	364.41	363.71	360.51	360.91	360.31	360.81	360.31	360.41	361.21
29	363.01	......	365.01	364.21	363.71	362.11	360.91	360.31	360.81	360.31	361.41	360.41
30	362.91	......	365.11	364.51	363.71	361.91	360.81	360.31	361.01	360.31	361.11	361.21
31	363.01	......	365.21	......	363.63	......	361.01	360.31	......	360.91	......	361.21

SENECA RIVER AT HIGHWAY BRIDGE, BELGIUM, N. Y.

A box-and-chain gage was established on the down-stream end of the right-hand pier of the bridge across Seneca river at Belgium, April 14, 1904, by this Department. The gage scale reads decimally from zero to 9 feet. The standard chain length is 20 feet and the gage datum 358.27. Readings are taken each morning by Solomon Walts.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River at Highway Bridge, Belgium, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	360.07	362.97	365.47	365.27	364.87	363.67	361.87	360.67	360.67	360.67	361.17	360.97
2	360.77	362.57	365.37	365.27	365.27	363.57	361.77	360.87	360.57	360.87	360.97	360.97
3	360.87	362.77	365.27	365.27	365.47	363.37	361.77	360.47	360.57	360.57	360.77	360.87
4	360.77	362.67	365.27	365.27	365.37	363.27	361.77	360.47	360.57	361.07	360.67	360.77
5	360.67	362.87	365.27	365.17	365.37	363.37	361.77	360.57	360.87	360.87	360.67	361.17
6	361.27	362.77	365.07	365.17	365.37	363.47	361.67	360.87	360.77	360.77	360.37	360.97
7	361.77	362.97	364.87	365.17	365.47	362.57	361.47	360.67	360.77	360.57	360.67	360.77
8	361.47	363.17	364.77	365.07	365.57	363.37	361.37	360.67	360.67	360.57	361.17	360.77
9	361.37	363.17	364.57	365.17	365.67	363.27	361.17	361.07	360.77	360.67	360.97	360.77
10	361.57	363.27	364.47	365.07	365.77	363.27	361.17	360.77	360.77	360.47	361.17	359.77
11	361.87	363.27	364.37	365.17	365.67	363.17	361.27	360.77	360.67	360.97	361.07	360.17
12	361.77	363.07	364.57	365.27	365.67	363.17	361.37	360.57	360.97	360.77	361.07	360.47
13	361.97	362.97	364.87	365.07	365.67	363.97	361.27	360.67	360.97	360.57	360.97	360.67
14	361.77	362.87	364.87	365.27	365.57	363.17	361.07	360.67	360.87	360.57	361.07	360.67
15	361.67	362.77	364.97	365.57	365.37	362.97	360.87	360.87	360.67	360.67	361.27	360.77
16	361.67	362.77	364.87	365.67	365.37	362.87	360.87	360.97	360.77	360.67	361.27	360.87
17	361.77	362.67	364.77	365.77	365.47	362.87	360.87	360.87	360.67	360.67	361.37	360.87
18	361.87	362.67	364.67	365.77	365.37	362.77	360.77	360.67	360.77	360.87	361.07	360.77
19	361.57	362.47	364.57	365.77	365.17	362.77	361.17	360.87	360.87	360.77	360.97	360.97
20	361.57	362.97	364.37	365.67	364.97	362.77	360.67	360.67	360.97	360.77	360.97	360.87
21	361.57	363.27	364.27	365.57	364.27	362.67	360.97	360.67	360.87	360.77	361.17	360.87
22	361.47	363.97	364.17	365.37	364.77	362.57	360.77	360.67	360.87	360.37	361.17	360.97
23	361.57	363.87	364.07	365.37	364.67	362.57	360.77	360.97	360.87	360.37	361.17	360.77
24	362.57	364.47	363.97	365.37	364.57	362.57	361.07	360.77	360.87	360.47	361.27	360.67
25	362.77	365.67	363.77	365.17	364.47	362.47	360.87	360.67	360.87	360.87	361.17	360.67
26	362.77	365.27	364.27	364.97	364.17	362.37	361.17	360.67	360.77	360.67	360.77	360.97
27	362.97	365.47	364.67	364.87	364.07	362.27	361.07	360.67	361.07	360.67	360.97	361.17
28	362.97	365.47	364.87	364.67	363.97	362.37	360.87	360.57	360.77	360.47	361.07	361.17
29	362.97	......	364.97	364.47	363.87	362.27	360.87	360.67	360.67	360.37	361.27	361.27
30	362.87	......	365.27	364.67	363.87	362.07	360.67	360.77	360.87	360.47	360.97	361.17
31	362.97	......	365.27	......	363.77	......	360.97	360.67	......	360.77	......	361.17

SENECA RIVER AT MUD LOCK NEAR LONG BRANCH, LIVERPOOL P. O., N. Y.

A gage was established at the junction of Oswego canal with Seneca river, April 16, 1904, by this Department. This gage also shows approximately the water-level at the junction of Seneca river and Onondaga outlet. The gage is vertical and reads from zero to 9 feet and is subdivided to tenths of feet by coppered staples. The gage zero is at elevation 360.49. Readings are taken daily by Frank Shane.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River at Mud Lock near Long Branch, Liverpool P. O., N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	360.89	362.99	365.99	365.69	365.39	364.09	362.29	361.09	361.09	361.09	360.99	361.29
2	360.89	362.99	365.99	365.79	365. 9	363.99	362.19	361.09	361.09	361.09	360.99	361.39
3	360.79	362.99	365.79	365.79	365.49	363.99	362.19	361.09	361.09	361.09	360.99	361.39
4	360.79	362.99	365.79	365.79	365.79	363.89	362.19	360.99	360. 9	361.29	360.99	361.39
5	360.99	363.09	365.49	365.79	365.99	363.89	362.19	360.99	360.99	361.09	360.89	361.39
6	361.49	363.19	365.49	365.69	366.19	363.79	362.09	360.99	360.99	360.99	360.59	361.59
7	361.79	363.29	365.29	365.69	366.19	363.79	361.99	360.99	360.99	360.99	361.29	361.49
8	361.89	363.39	365.09	365.69	366.09	363.79	361.89	360.99	360.99	360.99	361.49	361.19
9	361.89	363.69	364.99	365.59	366.19	363.69	361.89	360.99	361.09	360.99	361.49	361.19
10	361.89	363.59	364.99	365.59	366.19	363.69	361.79	360.99	361.09	360.99	361.39	359.89
11	361.89	363.49	364.99	365.59	366.29	363.59	361.79	360.89	361.09	360.89	361.39	360.59
12	361.79	363.29	364.89	365.49	366.29	363.49	361.69	360.89	361.09	360.89	361.39	361.19
13	361.79	363.29	364.89	365.49	366.19	363.49	361.49	360.89	361.09	360.99	361.39	361.39
14	361.69	363.39	364.99	365.89	366.09	363.39	361.49	360.89	361.09	361.09	361.59	361.29
15	361.59	363.39	365.09	366.19	365.99	363.19	361.49	361.09	361.09	361.09	361.39	361.29
16	361.59	363.39	365.19	366.29	365.99	363.19	361.39	361.09	361.09	361.09	361.29	361.39
17	361.59	363.49	365.19	366.29	365.99	363.19	361.29	361.09	360.99	361.09	361.39	361.39
18	361.49	363.49	365.09	366.29	365.89	363.09	361.29	361.09	361.19	360.99	361.39	361.49
19	361.49	363.49	364.99	366.29	365.79	363.09	361.09	361.09	361.09	360.99	361.49	361.49
20	361.59	363.49	364.79	366.19	365.59	362.99	360.99	361.09	361.19	360.89	361.49	361.49
21	361.59	363.89	364.69	366.09	365.49	362.89	361.19	361.19	361.19	360.8	361.39	361.39
22	361.79	364.19	364.59	366.09	365.39	362.79	361.19	361.19	361.19	360.79	361.49	361.39
23	361.99	364.39	364.39	365.99	365.19	362.79	361.19	361.19	361.09	360.79	361.59	361.39
24	362.69	365.59	364.59	365.89	365.09	362.79	361.19	361.19	361.09	360.89	361.59	361.19
25	362.79	366.09	364.79	365.79	364.89	362.79	361.19	361.19	361.09	360.99	361.59	361.19
26	362.79	366.09	365.39	365.49	364.59	362.59	361.19	361.19	361.09	360.99	561.49	361.09
27	362.89	365.99	365.49	365.39	364.49	362.59	361.19	361.19	361.19	360.59	361.39	360.99
28	362.89	365.99	365.59	365.29	364.39	362.49	361.19	360.59	361.19	360.59	361.39	360.99
29	363.09	......	365.79	365.19	364.29	362.39	361.09	361.09	361.09	360.69	361.29	360.79
30	363.09	......	365.69	365.19	364.19	362.29	361.09	361.09	361.19	360.79	361.29	360.89
31	362.99	......	365.69	......	364.09	......	361.09	361.09	......	361.09	......	360.89

ONONDAGA CREEK.

DESCRIPTION.

Onondaga lake receives the drainage from two principal tributaries, Onondaga creek and Otisco lake outlet, or Nine Mile creek. The lake is drained by a short outlet about one mile in length, entering Seneca river at Mud Lock. The outlet was formerly improved by the State for the purpose of draining lands adjoining the lake and reducing the flood level. The accompanying table shows the maximum recorded stages in the lake at various times. The fall from the foot of the lake to Seneca river is very slight. The stage is affected by a growth of aquatic plants so that the discharge from the outlet is apparently not a direct function of the stage. The stage of the lake is also affected by the stage of Seneca river. It is stated that flows in Onondaga lake usually recede before the maximum stage of Seneca river, so that at times the current in the outlet is reversed and water flows from the river into the lake. A detailed description of the drainage basin, with results of current-meter measurements made in the outlet, may be found in the report of the State Engineer and Surveyor for 1904, pages 494–501.

ONONDAGA OUTLET NEAR LONG BRANCH, LIVERPOOL P. O., N. Y.

A gage was established by this Department, April 16, 1904, in the head of Onondaga outlet. The present gage is a vertical board scale reading from zero to 9 feet, divided into tenths of feet by coppered staples. It is attached to a branching willow tree on the right bank of the outlet about 300 feet above the highway bridge, leading to Long Branch station of the Syracuse & Baldwinsville Electric railroad. Readings are taken each morning by Joseph Kennedy. The gage zero was at elevation 360.97, preceding March 27, 1907, and at elevation 361.07, beginning March 27, 1907.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Onondaga Outlet near Long Branch, Liverpool P. O., N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	361.17	363.37	366.07	365.87	......	364.27	362.67	361.67	361.17	361.47	361.17	361.57
2	361.17	363.17	366.07	365.87	365.77	364.27	362.47	361.67	361.17	361.47	361.17	361.57
3	361.27	363.17	365.97	365.97	365.87	364.17	362.27	361.57	361.27	361.47	361.17	361.47
4	361.37	363.07	365.87	365.97	365.97	364.17	362.17	361.57	361.27	361.47	361.17	361.47
5	361.47	363.17	365.77	365.97	366.07	364.07	362.17	361.57	361.27	361.47	361.17	361.47
6	361.57	363.27	365.67	365.87	366.07	364.07	362.07	361.47	361.27	361.37	361.17	361.47
7	361.67	363.47	365.67	365.87	366.07	363.87	362.07	361.47	361.27	361.37	361.17	361.47
8	361.77	363.77	365.57	365.87	366.17	363.57	362.07	361.47	361.27	361.37	361.27	361.47
9	361.87	363.77	365.57	365.77	366.17	363.67	361.97	361.47	361.37	361.37	361.47	361.47
10	361.97	363.67	365.47	365.77	366.07	363.87	361.97	361.47	361.37	361.37	361.47	361.47
11	362.07	363.67	365.47	365.77	365.97	363.87	361.97	361.47	361.37	361.37	361.47	361.47
12	362.07	363.57	365.37	365.87	365.97	363.77	361.97	361.47	361.37	361.37	361.57	361.47
13	362.07	363.57	365.37	365.97	365.97	363.77	361.87	361.47	361.37	361.27	361.57	361.47
14	362.07	363.47	365.27	366.17	366.07	363.67	361.87	361.47	361.37	361.27	361.57	361.47
15	362.17	363.47	365.27	366.47	366.07	363.67	361.77	361.47	361.37	361.27	361.57	361.47
16	362.17	363.47	365.17	366.47	366.07	363.57	361.77	361.47	361.37	361.17	361.57	361.47
17	362.17	363.47	365.17	366.47	365.97	363.47	361.87	361.47	361.37	361.17	361.57	361.47
18	362.17	363.57	365.07	366.37	365.87	363.37	361.87	361.47	361.37	361.17	361.57	361.47
19	362.27	363.57	364.97	366.37	365.77	363.27	361.77	361.47	361.37	361.17	361.57	361.47
20	362.37	363.57	364.87	366.27	365.67	363.27	361.77	361.57	361.37	361.17	361.57	361.47
21	362.47	363.57	364.87	366.27	365.57	363.17	361.77	361.57	361.37	361.17	361.57	361.47
22	362.57	363.87	364.97	366.17	365.57	363.17	361.67	361.57	361.37	361.17	361.57	361.47
23	362.67	364.57	365.07	365.97	365.47	363.07	361.67	361.57	361.37	361.17	361.57	361.47
24	362.77	365.57	365.17	365.77	365.27	363.07	361.67	361.57	361.47	361.17	361.57	361.47
25	362.97	366.07	365.37	365.67	365.07	362.97	361.67	361.47	361.47	361.17	361.57	361.47
26	363.37	366.17	365.57	365.57	364.87	362.97	361.67	361.37	361.47	361.17	361.57	361.57
27	363.37	366.27	365.77	365.37	364.67	362.97	361.67	361.37	361.47	361.17	361.57	361.57
28	363.37	366.17	365.77	365.27	364.47	362.87	361.67	361.27	361.47	361.17	361.57	361.57
29	363.37	......	365.77	365.17	364.47	362.87	361.67	361.17	361.47	361.17	361.57	361.57
30	363.37	......	365.77	365.17	364.47	362.87	361.67	361.17	361.47	361.17	361.57	361.57
31	363.37	......	365.77	......	364.37	......	361.67	361.17	......	361.17	......	361.57

ONONDAGA LAKE AT SYRACUSE, N. Y.

A record of the water-level of Onondaga lake at the entrance of Onondaga creek in Syracuse has been kept by this Department, beginning May 14, 1904. A chain-and-box gage was formerly maintained on the abutment of the New York Central bridge crossing Onondaga creek. A bench-mark on the angle of the down-stream side of the left-hand abutment of this bridge, consisting of a bolt head in the bridge-seat is at elevation 369.55. During 1909 the readings have been taken by measuring downward from a reference point.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Onondaga Lake at Syracuse, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	361.55	363.45	366.25	366.05	365.45	364.40	363.00	362.05	361.75	361.85	361.75	361.75
2	361.45	363.35	366.15	366.05	365.95	364.35	362.85	362.05	361.75	361.85	361.75	361.75
3	361.45	363.25	366.15	366.05	366.15	364.15	362.85	361.95	361.75	361.85	361.75	361.75
4	361.45	363.15	366.05	366.05	366.15	364.05	362.80	361.95	361.65	361.85	361.75	361.75
5	361.75	363.15	365.85	366.05	366.15	364.05	362.75	361.95	361.65	361.75	361.80	361.75
6	362.05	363.55	365.85	366.00	366.25	364.10	362.65	361.95	361.65	361.75	361.85	361.75
7	362.05	363.75	365.65	365.95	366.35	364.10	362.65	361.85	361.65	361.75	361.80	361.70
8	361.95	363.85	365.55	365.95	366.40	364.05	362.65	361.85	361.65	361.75	361.75	361.65
9	361.95	363.85	365.45	365.85	366.35	363.95	362.60	361.95	361.65	361.75	361.75	361.65
10	362.05	363.85	365.35	365.85	366.35	363.95	362.55	361.95	361.95	361.75	361.75	361.65
11	362.25	363.85	365.65	365.85	366.45	364.00	362.75	361.95	361.75	361.75	361.75	361.65
12	362.25	363.75	365.85	365.80	366.45	363.95	362.45	361.85	361.65	361.75	361.75	361.65
13	362.25	363.65	365.95	365.75	366.35	363.95	362.45	361.85	361.65	361.75	361.75	361.65
14	362.25	363.55	365.95	365.95	366.35	363.85	362.35	361.75	361.65	361.75	361.75	361.65
15	362.35	363.55	365.85	366.45	366.25	363.85	362.15	361.75	361.65	361.75	361.80	361.65
16	362.35	363.55	365.75	366.55	366.25	363.75	362.15	361.95	361.75	361.75	361.85	361.65
17	362.35	363.45	365.65	366.55	366.25	363.65	362.15	361.95	361.75	361.75	361.85	361.65
18	362.35	363.35	365.55	366.55	366.15	363.65	362.05	361.95	361.75	361.75	361.80	361.65
19	362.35	363.25	365.35	366.55	365.95	363.55	362.05	361.95	361.75	361.75	361.75	361.65
20	362.35	363.65	365.25	366.55	365.85	363.45	362.05	361.95	361.75	361.75	361.75	361.65
21	362.35	364.25	365.05	366.35	365.65	363.45	362.10	361.95	361.75	361.75	361.75	361.65
22	362.35	364.55	364.95	366.25	365.55	363.40	361.95	361.85	361.65	361.75	361.75	361.65
23	362.55	364.75	364.85	366.15	365.45	363.35	361.95	361.85	361.65	361.75	361.80	361.65
24	362.85	365.55	364.79	366.05	365.35	363.30	362.05	361.95	361.75	361.75	361.85	361.65
25	363.35	366.25	364.95	365.85	365.15	363.25	362.15	361.75	361.75	361.75	361.85	361.65
26	363.45	366.55	365.65	365.75	365.00	363.25	362.15	361.75	361.75	361.75	361.85	361.65
27	363.55	366.38	365.85	365.65	364.85	363.15	362.05	361.75	361.75	361.75	361.85	361.65
28	363.55	366.25	365.95	365.45	364.75	363.15	362.05	361.75	361.75	361.75	361.85	361.65
29	363.55	......	366.05	365.25	364.70	363.10	362.05	361.75	361.85	361.75	361.85	361.65
30	363.55	......	366.05	365.25	364.60	363.05	362.05	361.75	362.05	361.75	361.85	361.65
31	363.55	......	366.05	......	364.45	.....	362.05	361.75	......	361.75	......	361.65

ONONDAGA CREEK AT TEMPLE ST., SYRACUSE, N. Y.

A gaging station was established on Onondaga creek at Temple street bridge, Syracuse, by Guy Moulton, for this Department, January 16, 1908. The elevation of water-surface when the gage reads zero is 376.11. Observations are taken each morning and night by L. Moulton. Current-meter measurements have been made from the bridge by the Syracuse Intercepting Sewer Commission.

In the fall of 1908 a coffer-dam was constructed by the Intercepting Sewer Board, which caused backwater at the Temple St. gaging station, making it impossible to determine the discharge for the portion of the year not covered by the accompanying daily discharge table. The creek crosses under the Erie canal between the Temple St. and Belden Ave. stations, and water wasted or drawn from the canal and discharged into Onondaga creek greatly increases the flow in the creek at times, so that the record at Belden Ave. does not show that natural drainage of the creek itself and is not comparable with the Temple St. record, although by taking the difference between the recorded flow at the two stations on any given day the amount of water entering the creek from the Erie canal may be approximately estimated. The drainage area at the point of gaging is 108 square miles.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Onondaga Creek at Temple St., Syracuse, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	378.56	378.66	380.09	380.76	380.41	378.91	378.45	*a*	378.37	378.42	378.29	*a*
2	378.08	378.87	380.28	*a*	380.86	379.02	378.52	378.28	378.33	378.74	378.22	378.41
3	378.36	378.78	380.04	380.67	380.26	378.99	378.61	378.30	378.30	*a*	378.32	378.38
4	378.28	378.64	380.07	380.64	379.95	378.90	*a*	378.30	378.31	378.38	378.27	378.41
5	378.70	378.79	379.32	380.29	379.86	379.52	*a*	378.22	378.28	378.33	378.27	387.33
6	379.45	381.37	379.73	380.55	379.46	379.22	378.53	378.20	378.26	378.31	378.23	378.36
7	379.18	380.71	379.82	381.05	380.61	378.89	378.57	378.21	378.24	378.28	378.24	378.36
8	378.45	379.83	379.70	380.92	380.44	378.97	378.44	378.25	378.26	378.28	378.32	378.35
9	378.79	379.08	379.64	380.25	380.07	378.75	*a*	378.19	378.25	378.33	378.26	378.33
10	378.66	379.26	380.89	380.31	380.28	378.93	378.46	378.31	378.28	378.25	378.24	378.26
11	378.69	379.61	383.57	380.17	380.13	379.56	378.44	378.25	378.27	378.28	378.22	*a*
12	378.87	379.02	381.17	380.33	380.09	378.93	378.43	378.26	378.29	378.40	378.21	378.30
13	378.45	379.30	380.62	379.84	379.99	379.04	378.40	378.25	378.35	378.45	378.22	378.36
14	378.63	379.44	380.33	381.83	379.95	379.21	378.37	378.23	378.31	378.33	378.22	*a*
15	378.65	*a*	380.22	382.83	380.19	379.12	378.32	378.20	378.28	378.33	378.27	378.75
16	378.30	*a*	379.99	381.29	380.43	379.00	378.37	378.56	378.40	378.30	378.24	378.58
17	378.47	379.27	379.91	380.59	379.88	378.89	378.40	378.43	378.31	*a*	378.30	378.49
18	378.61	379.15	379.73	380.58	379.81	379.57	378.43	378.43	378.25	378.32	*a*	378.38
19	378.33	379.11	379.76	380.30	379.71	379.12	378.50	378.53	378.23	378.34	*a*	*a*
20	378.40	383.18	379.70	380.31	379.73	378.85	378.40	378.35	378.24	378.46	378.36	378.09
21	378.47	382.54	379.79	379.88	379.59	378.80	378.41	378.33	378.31	378.35	378.33	378.32
22	378.68	*a*	379.59	379.71	379.70	378.81	378.43	378.27	378.10	378.39	*a*	378.26
23	380.36	381.24	379.54	379.90	379.41	378.73	378.52	378.23	378.30	378.47	*a*	*a*
24	380.75	381.87	379.60	379.73	379.45	378.82	378.77	378.30	378.52	*a*	*a*	378.37
25	380.26	383.98	381.12	379.62	*a*	378.61	*a*	378.28	*a*	378.49	*a*	*a*
26	379.67	381.14	382.36	379.37	379.27	378.67	378.51	378.26	*a*	378.40	378.42	*a*
27	379.20	381.25	381.07	379.61	379.24	378.53	378.44	378.24	378.39	378.42	378.46	378.33
28	379.06	380.64	381.37	379.50	379.37	378.61	378.32	378.26	378.39	*a*	378.38	378.35
29	379.10	......	381.11	379.49	379.42	378.62	378.36	378.43	378.36	378.34	378.55	378.17
30	378.80	......	380.86	379.98	*a*	378.72	378.26	378.28	378.41	378.39	*a*	378.34
31	378.74	......	380.60	......	*a*	......	378.34	378.24	......	*a*	......	378.37

a No record.

SENECA RIVER AT BALDWINSVILLE, N. Y.

This station was established November 12, 1898, by Geo. W. Rafter, for the U. S. Deep Waterways Commission. It is maintained by U. S. Geological Survey in coöperation with this Department. The gaging station is located at the State dam in Baldwinsville, 12.5 miles along river from the junction of Seneca river with Oneida river. These two streams unite at Three River Point to form Oswego river.

The location of the gaging station is shown on the Baldwinsville sheet, United States Geological Survey topographic map.

The discharge over the main dam is calculated by the formula for a broad, flat-crested weir when flash-boards are removed. Discharge over flash-boards is caluclated by the Francis formula. Gage readings in the river channel below the dam are utilized to determine the average working head on turbines. Discharge through the three main canals is determined from records of the run of water-wheels, kept in each mill, and from the recorded lockage and opening of paddles at the Oswego canal lock at the foot of the canal.

Current-meter measurements, to determine the leakage of the several mills, have been made during 1909, as in preceding years.

Discharge data for 1909 is not yet available.

SENECA RIVER BELOW DAM AT BALDWINSVILLE, N. Y.

The gage below the dam at Baldwinsville was establshed to determine the head at the mills in connection with the record of discharge, and is also used to determine the elevation of water-surface. A box-and-chain gage is located on the up-stream side of the D., L. & W. railroad bridge near the left-hand end of the bridge. The standard datum of the gage is at elevation 361.75; the chain length 12.77 feet. Gage readings are taken each morning and night.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River below Dam at Baldwinsville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	362 65	363 75	366 40	366.15	365 87	364.60	363.47	*a*	362.90	363.05	363.30	363.15
2	362.65	363.60	366 35	366 20	366.20	364 52	363.35	*a*	362.95	362.98	363.37	383.17
3	362 80	363.40	366 35	366 20	366.42	364 40	363.35	*a*	362.95	362.78	363.37	363.15
4	362 90	363.45	366 40	366 20	366 50	364 32	363 35	*a*	362.92	363.02	363.40	363.15
5	362 90	363.45	366 35	366.17	366 50	364.35	363 20	*a*	362.80	363.08	363.47	362.70
6	362.95	363 70	366 05	366 15	366.55	364.35	363 17	*a*	363 00	363.10	363.47	363.10
7	362 95	363 85	365.75	366.10	366 75	364 42	363.07	*a*	362.95	363.10	363.35	363.20
8	362 95	363.90	365 55	366 02	366.75	364.30	363 05	*a*	362.92	363.08	363.33	363.20
9	362 90	363 95	365.45	366 02	366 75	364 32	363.00	*a*	362.98	363.02	363.27	363.20
10	362 90	363.95	365 40	366 05	366 85	364 25	363 05	*a*	362.95	362.85	363.27	362.95
11	363 00	364.00	366.40	366 00	366.85	364 25	363.15	*a*	362.90	362.92	363.23	363.00
12	362 95	363.95	365 80	365.95	366.77	364 25	363.10	*a*	362.80	363.05	363.20	362.95
13	362.95	363 95	365 85	366.00	366.75	364 25	363 02	*a*	362 95	363.00	363.20	363.10
14	362 95	363.85	365 90	366 25	366 62	364.20	363 02	*a*	362.90	363.00	362.95	363.10
15	362.95	363.90	365.90	366 57	366 52	364.15	363 00	*a*	362.92	363.05	363.15	363 15
16	362 85	362 90	365 90	366 70	366.50	364 12	362 97	*a*	362 92	363 05	363.17	363.20
17	362 85	363 90	365 90	366 70	366.40	364 02	363 00	363.15	362.95	362.75	363.17	363.20
18	362.90	364.00	365 90	366 73	366 32	364 02	362.90	362 95	362 98	362.95	363.15	363.20
19	362 90	364 15	365 80	366 75	366 20	363 96	362 97	362.95	362.83	363.10	363.17	362.75
20	362 80	363 95	365.17	366.72	366.02	364 00	362.87	363.02	362.92	363.02	363.15	363.07
21	362.90	364.25	365 15	366 65	365.92	363 97	362.87	363.02	363.00	363.00	362.80	363.05
22	362 90	365 05	365.25	366 50	365 75	363 85	362.87	362 87	362.98	363.02	363.05	362.97
23	362.95	365.15	365.10	366.40	365.57	363.85	362 87	363.02	363 02	363.12	363.17	362.97
24	363.15	365.40	365 00	366.20	365 47	363.85	362 87	362.95	362 98	363.05	363.15	363 00
25	363 65	367 35	365 10	366 05	365.20	363 77	.52 65	362 95	363 00	363.25	363.10	362.80
26	363 85	367.15	365 10	365 92	365.15	363 72	362.75	362.95	362.85	363.25	363.17	6!.75
27	363 95	366 40	365 85	365 80	364 92	363 65	*a*	362.92	363.08	363 25	363.17	362 95
28	363 80	365.40	365 90	365 60	364.90	363.62	*a*	362.95	363 05	363.25	362.97	362.97
29	363 70	......	365 90	365.45	364 80	363 55	*a*	362.75	362.95	363.25	363.17	362.97
30	363.60	......	365 90	365.60	364.75	363.50	*a*	362.92	362.98	363.25	363.15	362.95
31	363.70	......	365.90	......	364.75	......	*a*	362.90	......	363.25	......	*a*

a No record.

Seneca River above Dam at Baldwinsville, N.Y.

The elevation of water-surface above Baldwinsville dam is determined from the readings of the crest gage, which was established for the purpose of gaging the discharge. The gage is vertical and reads from zero to 8 feet and is divided to feet and tenths by galvanized staples. It is attached to the down-stream face of the river wall at the up-stream end of the left-hand abutment of the dam. The zero mark of the gage is at elevation 372.27, which is also the elevation of the masonry crest of the dam. When the water is drawn below the crest level the readings are taken by measuring downward from the zero mark on the gage. Gage readings are taken each morning and night.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River above Dam at Baldwinsville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	370.97	373.12	374.92	374.49	374.37	373.82	372.89	372.17	371.29	372.45	*a*	372.87
2	372.02	373.02	374.92	374.42	374.65	373.75	372.75	371.77	371.57	372.45	*a*	372.75
3	372.62	372.77	374.87	374.42	374.57	373.60	372.75	371.77	371.59	373.52	*a*	372.67
4	372.32	372.77	374.92	374.62	374.59	373.69	372.92	371.72	371.72	373.19	*a*	392.55
5	371.77	372.72	374.92	374.49	374.69	373.72	372.85	371.62	371.99	372.95	*a*	373.07
6	372.47	373.07	374.92	374.45	374.77	373.77	372.69	371.57	371.97	372.67	*a*	372.95
7	372.42	373.37	374.22	374.47	374.77	373.65	372.52	371.70	371.57	372.35	*a*	372.52
8	372.42	373.62	374.22	374.47	372.79	373.05	372.45	371.65	371.42	372.32	*a*	372.52
9	372.47	374.02	374.22	374.39	374.89	373.59	372.42	371.60	371.32	371.87	*a*	372.47
10	372.62	373.77	374.27	374.39	374.82	373.50	372.52	370.87	371.29	372.32	*a*	372.67
11	372.27	373.62	374.57	374.55	374.77	373.57	372.72	370.80	371.37	372.25	*a*	372.27
12	372.39	373.32	374.32	374.32	374.69	373.02	372.55	370.85	371.87	372.05	*a*	372.77
13	372.07	373.22	374.37	374.37	374.67	373.67	372.49	371.25	371.95	372.09	393.12	372.42
14	371.32	373.52	374.47	374.52	374.65	373.55	372.47	371.75	371.72	372.09	373.32	372.19
15	371.57	373.52	374.37	374.37	374.67	373.47	372.45	372.17	371.79	372.19	373.27	372.27
16	371.37	372.77	374.32	374.62	374.77	373.42	372.45	372.02	372.02	372.05	372.99	372.27
17	371.97	372.57	374.27	374.09	374.62	373.39	372.52	371.97	372.05	372.55	372.79	372.19
18	371.85	372.62	374.32	374.82	374.59	373.37	372.59	372.02	372.05	372.62	372.47	371.92
19	371.27	373.02	374.32	374.65	374.55	373.42	372.22	371.92	372.37	372.05	372.42	372.47
20	370.52	373.97	374.27	374.65	374.52	373.47	371.99	371.85	372.22	372.07	372.55	372.02
21	370.67	373.67	374.27	374.65	374.45	373.27	371.67	371.92	372.07	372.17	373.25	371.57
22	370.92	373.97	374.17	374.62	374.37	373.25	371.59	372.71	372.17	372.95	373.62	371.32
23	371.45	374.07	373.87	374.59	374.39	373.25	371.97	371.92	372.32	373.32	373.57	371.32
24	373.05	374.32	373.62	374.52	374.25	373.22	372.25	371.62	372.67	373.57	373.39	371.27
25	373.22	374.92	373.67	374.57	374.17	373.17	372.37	371.45	372.72	373.67	373.59	372.02
26	373.27	374.97	373.97	374.37	374.05	373.22	372.02	371.42	373.05	373.77	373.39	372.27
27	373.22	374.97	374.37	374.32	373.99	373.27	371.99	371.32	372.92	373.99	372.85	371.47
28	373.22	375.02	374.37	374.29	373.92	373.07	372.15	371.42	372.27	374.19	373.37	371.32
29	373.07	......	374.42	374.25	373.95	372.97	372.27	371.97	372.12	374.25	373.47	371.12
30	372.75	......	374.42	374.25	374.07	372.89	372.07	371.72	372.05	374.19	373.17	371.12
31	373.05	......	374.42	......	373.95	......	372.05	371.32	......	*a*	......	370.97

a No record.

SENECA RIVER AT FOOT OF JACK'S REEF, MEMPHIS, N. Y.

A gage was established on Seneca river below Jack's Reef, April 20, 1904, by this Department. The gage is attached to a willow tree on the left bank of the stream and is located a few hundred feet below the entrance of the State ditch and also below a series of eel weirs at Jack's Reef. The gage is vertical and reads from zero to 9 feet and is subdivided to tenths by coppered staples. Readings are taken by Frank Burns at 8 A. M. each day.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River at Foot of Jack's Reef, Memphis, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	372.00	373.40	376.10	375.90	375.50	373.70	373.80	373.40	373.00	373.10	374.10	373.00
2	372.10	373.20	376.10	375.90	375.80	374.60	373.80	373.40	373.00	373.20	374.10	372.90
3	372.50	373.20	376.10	375.90	376.00	374.50	373.70	373.40	373.00	373.50	374.20	372.70
4	372.50	373.20	376.00	375.90	376.10	374.50	373.70	373.40	373.00	373.60	374.20	372.60
5	372.20	373.20	375.90	375.90	376.20	374.60	373.60	373.30	373.00	373.30	374.10	372.70
6	372.50	373.30	375.80	376.80	376.30	374.60	373.60	373.30	373.10	373.20	374.20	372.80
7	372.70	373.80	375.60	375.80	376.60	374.60	373.50	373.20	372.90	373.00	374.20	372.70
8	372.70	374.10	375.50	375.80	376.60	374.50	373.50	373.10	372.90	372.80	374.00	372.60
9	372.70	374.30	375.30	375.70	376.50	374.50	373.50	373.10	372.90	372.70	373.90	372.50
10	372.70	374.30	375.30	375.70	376.50	374.40	373.50	373.00	372.90	372.60	373.70	372.50
11	372.70	374.20	375.60	375.70	376.50	374.40	373.50	373.00	372.90	372.70	373.50	372.40
12	372.70	374.20	375.60	375.60	376.40	374.40	373.60	372.90	372.90	372.70	373.40	372.40
13	372.60	374.00	375.70	375.50	376.30	374.40	373.60	372.90	373.00	372.70	373.30	372.40
14	372.40	373.70	375.80	375.50	376.30	374.40	373.60	373.00	373.00	372.60	373.20	372.30
15	372.40	373.70	375.80	375.80	376.20	374.30	373.60	373.10	372.90	372.70	373.30	372.40
16	372.30	374.40	375.70	376.00	376.20	374.20	373.60	373.30	373.00	372.60	373.20	372.30
17	372.40	374.10	375.60	376.20	376.20	374.20	373.60	373.40	373.10	372.70	373.00	372.30
18	372.50	373.60	375.50	376.20	376.00	374.20	373.60	373.40	373.00	372.80	372.80	372.20
19	372.20	373.20	375.40	376.30	375.90	374.10	373.60	373.30	373.00	372.60	372.80	372.30
20	372.10	373.60	375.40	376.20	375.80	374.10	373.40	373.30	373.10	372.40	372.80	372.30
21	372.10	374.20	375.30	376.10	375.70	374.10	373.30	373.30	373.10	372.40	373.20	371.90
22	372.10	374.50	375.20	376.00	375.60	374.10	373.30	373.20	373.10	372.80	373.40	371.90
23	372.40	374.80	375.00	375.90	375.50	374.00	373.40	373.20	373.20	373.20	373.50	371.80
24	373.20	375.60	374.90	375.80	375.40	374.00	373.60	373.10	373.30	373.40	373.40	371.80
25	373.50	376.00	374.90	375.80	375.30	374.00	373.60	373.10	373.30	373.60	373.20	371.90
26	373.80	375.90	375.20	375.70	375.20	374.00	373.60	373.10	373.30	3 3.60	373.10	372.00
27	374.00	375.90	375.50	375.60	375.10	373.90	373.50	373.10	373.40	373.80	372.80	372.00
28	373.90	376.10	375.70	375.50	374.90	373.90	373.50	373.00	373.20	374.00	373.00	371.80
29	373.80	......	375.80	375.30	374.90	373.80	373.50	373.10	373.00	374.00	373.20	371.70
30	373.60	......	375.80	375.30	374.90	373.80	373.50	373.10	373.10	374.00	373.10	371.60
31	373.40	......	375.80	......	374.80	......	373.40	373.00	......	374.00	......	371.50

SENECA RIVER ABOVE JACK'S REEF, JORDAN, N. Y.

A gage was established on the Seneca river above Jack's Reef and near the head of the State ditch, April 20, 1904, by this Department. Several gages have been used. The readings have been taken during 1909 from a vertical gage attached to a large tree on the right-hand bank of the stream below the old cofferdam at the head of the State ditch. The bench-mark used to determine the elevation of the gage zero is a nail in the root of a large poplar tree, to which the gage is attached. The bench-mark is at elevation 382.482.

The gage datum has frequently been changed. During 1907 it was as follows: April 20, 1906, to March 24, 1907, 374.81; March 25 to May 17, 1907, 377.07; May 18, 1907, to date, 375.44. Readings are taken each morning by John P. Watts. The gage is located one-half mile below the outlet of Cross lake and is about 4 miles north of the village of Jordan.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River above Jack's Reef, Jordan, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	373.84	375.0'	379.44	379.14	378.74	377.84	375.67	374.44	374.04	374.04	374.24	373.14
2	373.84	375.04	379.34	379.14	378.94	377.44	375.64	374.34	373.94	374.04	374.34	373.14
3	373.94	374.94	379.14	379.14	379.24	377.34	375.54	374.34	373.94	373.94	374.44	373.04
4	373.94	374.94	378.94	379.24	379.44	377.24	375.3	374.24	373.84	373.84	374.44	373.04
5	374.04	374.84	378.74	379.14	379.64	377.24	375.14	374.24	373.84	373.64	374.44	373.04
6	374.04	375.94	378.44	379.14	379.84	377.24	375.14	374.24	373.84	373.54	374.44	373.04
7	374.14	376.14	378.44	379.04	379.94	377.24	375.04	374.14	373.84	373.44	374.34	372.94
8	374.14	376.34	378.44	379.04	380.04	377.14	374.84	374.14	373.84	373.24	374.24	372.94
9	374.24	377.14	378.54	378.94	380.04	377.14	374.64	374.14	373.84	373.24	374.04	372.94
10	374.24	377.34	378.54	378.94	380.04	377.04	374.54	374.04	373.84	373.24	373.84	372.84
11	374.34	376.44	378.64	378.94	379.94	377.04	374.44	374.04	373.84	373.24	373.74	372.84
12	374.34	376.24	378.74	388.94	379.84	376.94	374.44	373.94	373.84	373.24	373.64	372.84
13	374.24	375.94	378.84	379.04	379.74	376.94	374.44	373.94	373.84	373.24	373.54	372.84
14	374.24	375.84	378.94	379.04	379.64	376.84	374.34	373.84	373.84	373.24	373.54	372.84
15	374.24	375.74	379.04	379.24	379.54	376.84	374.34	373.84	373.84	373.24	373.54	372.74
16	374.14	375.54	378.94	379.34	379.44	376.74	374.34	374.04	373.84	373.24	373.44	372.74
17	374.14	375.34	378.84	379.44	379.34	376.74	374.34	394.24	373.84	373.24	373.44	372.74
18	374.14	375.14	378.64	379.64	379.24	376.64	374.34	374.24	373.84	373.24	373.44	372.74
19	374.04	375.34	378.54	379.64	379.14	376.54	374.34	374.34	373.84	373.24	373.44	372.64
20	373.94	376.54	378.44	379.64	379.04	376.44	374.34	374.24	373.94	373.24	373.44	372.54
21	373.84	376.74	378.44	379.54	378.84	376.34	374.34	374.14	374.04	373.34	373.54	372.44
22	374.04	377.14	377.64	379.44	378.74	376.34	374.44	374.14	374.04	373.34	373.74	372.34
23	375.64	377.44	377.74	379.24	378.64	376.24	374.54	374.14	374.14	373.44	373.04	372.34
24	376.04	378.44	377.84	379.14	378.54	376.24	374.64	374.14	374.24	373.54	373.54	372.24
25	376.24	379.44	377.94	378.94	378.54	376.14	374.64	374.14	374.24	373.74	373.54	372.24
26	376.44	379.44	378.24	378.74	378.44	376.14	374.64	374.14	374.24	373.94	373.44	372.24
27	376.54	379.44	378.44	378.54	378.34	376.04	374.64	374.14	374.24	374.04	373.34	372.14
28	376.34	379.44	378.74	378.44	378.34	375.94	374.54	374.04	374.14	374.04	373.34	3.2.14
29	376.04	......	378.94	378.24	378.24	375.94	374.64	374.04	374.14	374.14	373.24	372.04
30	375.24	......	378.94	378.24	378.24	375.84	374.64	374.04	374.14	3 4.14	373.24	371.94
31	375.04	......	379.04	......	378.04	......	374.64	374.04	......	374.24	......	371.84

SENECA RIVER AT HIGHWAY BRIDGE ABOVE CROSS LAKE, JORDAN, N. Y.

A gage was erected May 1, 1904, by H. U. Lyon of this Department at the highway bridge, commonly known as "Iron Bridge," over the Seneca river about one-half mile above Cross lake, for the purpose of obtaining a record of the fluctuation of the water-surface of the river at this point and of Cross lake. The elevation of water-surface is practically the same, there being very little appreciable slope in the river between the lake and the gaging station, except, perhaps, in time of high water.

The gage is a vertical board, graduated in feet and tenths, and is fastened to a willow tree on bank of river, on up-stream side of bridge, about 20 feet from south abutment, with its zero mark at elevation 373.79. Observations of the stage of the stream are taken daily by Mark Quimby.

The current of the stream is sluggish, especially during low water, but quite uniform. The river channel is of mud and straight for a considerable distance each way from the bridge.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River near Cross Lake, Jordan, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	373.99	375.09	379.69	379.29	378.69	377.74	375.79	374.59	374.19	374.29	374.49	373.54
2	373.99	375.09	379.69	379.29	379.14	377.59	375.69	374.59	374.09	374.24	374.54	373.39
3	373.99	375.09	379.69	379.39	379.54	3 7.49	375.59	374.49	374.09	373.99	374.59	373.29
4	373.99	375.09	379.69	379.39	379.74	377.39	375.44	374.49	374.09	373.99	374.59	373.19
5	374.09	375.09	379.24	379.39	379.84	377.39	375.29	374.49	374.09	373.89	374.59	373.09
6	374.19	375.54	378.84	379.29	380.04	377.39	375.19	374.39	374.09	373.64	374.49	373.19
7	374.29	376.34	378.79	379.29	380.14	377.39	375.14	374.39	374.09	373.44	374.49	373.29
8	374.39	376.79	378.09	379.24	380.14	377.39	375.09	374.29	374.09	373.29	374.49	373.19
9	374.39	376.89	378.69	379.19	380.09	377.29	375.09	374.29	374.09	373.19	374.39	373.09
10	374.39	376.89	378.74	379.09	380.19	377.29	375.09	374.19	373.99	373.19	374.19	372.94
11	374.39	376.64	378.94	378.99	380.09	377.19	375.19	374.14	373.99	373.19	374.09	372.79
12	374.39	376.34	379.14	378.89	380.09	377.19	375.24	374.09	373.99	373.24	374.04	372.69
13	374.39	376.09	379.24	378.79	379.99	377.19	375.29	374.09	373.99	373.29	373.84	372.79
14	374.29	376.09	379.29	379.19	379.84	377.09	375.24	374.09	374.09	373.29	373.69	372.79
15	374.29	375.89	379.24	379.44	379.74	376.99	375.14	374.09	374.09	373.29	733.69	372.89
16	374.29	375.69	379.14	379.54	379.64	376.89	375.09	374.29	374.09	373.29	373.69	372.89
17	374.19	375.44	379.04	379.74	379.44	376.79	374.99	374.39	374.19	373.19	373.54	372.89
18	374.09	375.24	378.84	379.79	379.39	376.69	374.89	374.39	374.19	373.24	373.44	372.79
19	374.09	375.19	378 64	379.79	379.39	376.59	374.79	374.39	374.19	373.19	373.39	372.69
20	373.99	375 74	378.54	379.79	379.24	376.49	374.69	374.29	374.19	373.09	373.39	372.69
21	373.99	376.74	378.34	379.69	379.04	376.49	374.69	374.29	374.19	373.09	373.49	372.54
22	374.14	377.44	378.14	379.69	378.94	376.49	374.69	374.29	374.29	373.19	373.89	372.49
23	374.39	377.94	377.99	379.54	378.74	376.39	374.74	374.29	374.29	373.44	373.89	372.39
24	375 14	378.79	377.99	379.34	378 64	376.39	374.79	374.29	374.39	373.69	373.79	372.34
25	375.99	379.39	378.14	379 14	378.44	376.29	374.79	374.19	374.39	373.84	373.69	372.29
26	376.54	379.39	378.49	378.94	378.29	376.29	374.79	374.19	374.39	373.99	373.59	372.39
27	376 64	379.54	378.84	378.74	378.14	376.19	374.69	374.19	374.39	374.14	373.39	372.39
28	376.49	379.64	379.04	378.59	378.04	376.09	374.69	374.19	374.39	374.29	373.44	372.34
29	376.09	......	379 19	378.49	377 94	375.99	374.69	374.19	374.29	374.34	373.54	372.29
30	375.59	......	379.29	378.49	377.89	375.89	374.69	374.19	374.29	374.39	373.69	372.19
31	375.24	......	379.29	......	377.89	......	374.69	374.19	......	374.49	......	372.09

SENECA RIVER AT MOSQUITO POINT BRIDGE, PORT BYRON, N. Y.

A gage was established at Mosquito Point bridge on Seneca river by this Department, April 21, 1904. Beginning in 1907 a vertical gage attached to a post set in the reed beds at the left-hand side of the stream above the bridge has been used. The gage is divided decimally by burned marks and reads from zero to 9 feet. Readings are taken each morning by William Prettie. The gage is located 3 miles north of Port Byron and is just below the entrance of Owasco lake outlet to Seneca river.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River at Mosquito Point Bridge, Port Byron, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	377.25	376.05	380.55	380.15	379.55	378.35	376.45	375.25	375.15	375.05	374.95	374.25
2	377.25	376.05	380.65	380.15	380.15	378.25	376.35	375.25	375.05	374.95	374.95	374.25
3	377.35	376.05	380.55	380.25	380.55	378.15	376.25	375.25	374.95	374.85	374.95	374.25
4	377.25	375.95	380.35	380.25	380.75	378.15	376.15	375.15	374.85	374.85	374.95	374.25
5	377.15	375.95	380.25	380.15	380.85	378.25	376.05	375.15	374.85	374.75	374.95	374.25
6	376.95	376.55	380.05	380.15	381.05	378.15	375.95	375.15	374.85	374.75	374.95	374.15
7	376.85	377.35	379.65	380.05	381.15	378.05	375.85	375.05	374.85	374.65	375.05	374.15
8	376.85	377.75	379.45	379.95	381.15	378.05	375.85	375.05	374.85	374.65	375.05	374.15
9	376.85	377.65	379.35	379.85	381.05	377.95	375.75	374.95	374.85	374.65	374.95	374.15
10	376.85	377.45	379.35	379.85	381.05	377.95	375.75	374.95	374.95	374.55	374.95	374.25
11	376.75	377.15	379.65	379.75	381.05	377.95	375.75	374.85	374.95	374.55	374.95	374.25
12	376.85	376.85	380.05	379.65	380.95	377.85	375.85	374.85	374.85	374.85	374.75	374.25
13	376.85	376.85	380.15	379.55	380.85	377.75	375.95	374.85	374.85	374.85	374.65	374.25
14	376.75	376.75	380.15	379.95	380.75	377.75	375.95	374.85	374.95	374.85	374.65	374.45
15	376.65	376.75	379.85	380.35	380.65	377.65	375.85	374.95	375.05	374.85	374.55	374.45
16	376.75	376.75	379.85	380.55	380.55	377.55	375.75	375.35	375.05	374.75	374.55	374.35
17	376.85	376.55	379.75	380.65	380.35	377.55	375.65	375.25	374.95	374.55	381.55	374.25
18	376.95	376.55	379.55	380.75	380.25	377.45	375.55	375.05	374.95	374.55	374.55	374.25
19	377.05	376.45	379.35	380.75	380.15	377.35	375.55	375.05	374.95	374.55	374.65	374.15
20	377.05	376.85	379.25	380.65	380.05	377.25	375.45	374.95	375.05	374.45	374.65	374.15
21	376.95	377.85	379.15	380.55	379.95	377.15	375.35	374.95	375.05	374.45	374.85	374.15
22	376.85	378.55	378.95	380.45	379.85	377.15	375.35	374.95	375.15	374.75	374.65	374.05
23	376.55	379.05	378.85	380.35	379.65	377.05	375.45	374.85	375.15	374.85	374.65	374.05
24	377.45	379.75	378.65	380.15	379.45	377.05	375.55	374.85	375.25	374.75	374.55	374.05
25	377.05	380.25	378.85	379.85	379.25	376.95	375.55	374.95	375.15	374.65	374.45	374.05
26	377.35	380.45	379.35	379.75	379.05	376.95	375.45	374.95	375.15	374.75	374.35	374.05
27	377.35	380.35	379.75	379.45	378.85	376.85	375.45	374.95	375.05	374.85	374.35	373.95
28	376.95	380.45	379.85	379.35	378.75	376.75	375.35	374.95	375.05	374.85	374.35	373.95
29	376.75	......	380.05	379.25	378.65	376.65	375.35	374.95	374.95	374.85	374.35	373.95
30	376.35	......	380.25	379.25	378.55	376.55	375.35	374.85	375.15	374.85	374.35	373.85
31	376.25	......	380.15	......	378.45	......	375.35	374.85	......	374.85	......	373.85

Seneca River at N. Y. C. R. R. Bridge near Fox Ridge, Savannah P. O., N. Y.

This gage is located on the N. Y. C. railroad bridge crossing Seneca river and Montezuma marsh 1¼ miles west of Fox Ridge station. The gage was established by this Department, May 4, 1904. Readings are taken each morning by J. H. Rupert, engineer in the adjacent pumping station. The gage is located on the ties of the up-stream track at the left-hand side of the stream. A box-and-chain gage is used.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River at N. Y. C. R. R. Bridge near Fox Ridge Savannah P. O., N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.a												
1	382.30	380.10	381.80	382.40	381.30	381.10	379.70	378.84	377.54	377.84	378.04	377.44
2	382.20	380.00	381.70	382.40	381.60	381.00	379.60	378.64	377.74	377.74	377.94	377.64
3	382.10	380.00	381.70	382.30	381.80	380.90	379.50	378.44	377.54	377.64	377.94	377.64
4	382.00	380.00	381.70	382.30	381.90	380.80	379.40	378.34	377.64	377.64	377.94	377.64
5	381.90	380.10	381.60	382.20	381.90	380.70	379.50	378.54	377.64	377.54	377.84	377.54
6	381.70	380.20	381.60	382.10	381.90	380.60	379.50	378.54	377.64	377.54	377.94	377.34
7	381.60	380.30	381.70	382.00	382.00	380.40	379.40	378.44	377.64	377.64	378.04	377.34
8	381.50	380.40	381.60	381.90	382.00	380.30	379.30	378.54	377.54	377.64	378.04	377.34
9	381.40	380.30	381.60	381.90	382.10	380.20	379.20	378.44	377.54	377.64	377.94	377.64
10	381.30	380.30	381.70	381.80	382.30	380.40	379.00	378.34	377.64	377.74	377.94	377.54
11	381.10	380.20	381.80	381.80	382.40	380.20	378.90	378.24	377.64	377.74	377.94	377.54
12	381.00	380.20	381.90	381.70	382.50	380.10	378.80	378.34	377.64	377.64	377.84	377.44
13	381.00	380.40	382.10	381.70	382.50	379.90	378.70	378.44	377.54	377.64	377.84	377.34
14	381.10	380.70	382.30	381.60	382.50	379.80	378.70	378.34	377.54	377.74	377.84	377.24
15	381.10	381.30	382.50	381.50	382.40	380.50	378.70	378.24	377.44	377.74	377.84	377.14
16	381.00	382.20	383.10	381.50	382.40	381.20	378.60	378.24	377.44	377.64	377.74	377.14
17	381.00	382.40	383.40	381.40	382.40	381.30	378.50	378.34	377.54	377.64	377.74	377.04
18	380.90	382.50	383.50	381.40	382.30	381.20	378.70	378.34	377.54	377.64	377.74	377.04
19	380.80	382.50	383.60	381.30	382.30	381.00	379.70	378.24	377.44	377.64	377.64	377.04
20	380.70	382.50	383.50	381.40	382.20	380.90	379.80	378.24	377.44	377.64	377.54	377.14
21	380.60	382.40	383.40	381.50	382.20	380.60	379.90	378.14	377.44	377.74	377.54	377.14
22	380.60	382.40	383.20	381.60	382.10	380.30	380.20	378.14	377.44	377.84	377.54	377.54
23	380.50	382.30	383.10	381.60	382.00	380.20	380.60	378.04	377.54	377.94	377.54	377.44
24	380.50	382.20	383.00	381.60	381.90	380.10	380.60	377.94	377.54	377.94	377.54	377.34
25	380.40	382.10	382.90	381.50	381.80	380.20	380.50	377.84	377.64	377.94	377.54	377.24
26	380.70	382.10	382.90	381.50	381.70	380.20	380.30	377.84	377.64	378.04	377.44	377.24
27	380.60	382.00	382.80	381.40	381.60	380.10	380.20	377.74	377.74	378.14	377.34	377.24
28	380.50	382.00	382.70	381.30	381.50	380.00	380.00	377.74	377.84	378.24	377.34	377.04
29	380.40	381.90	382.70	381.20	381.40	379.90	379.70	377.64	377.94	378.34	377.24	377.24
30	380.30	......	382.60	381.20	381.30	379.80	379.34	377.64	377.84	378.24	377.34	377.04
31	380.20	......	382.50	......	381.20	......	379.04	377.54	......	378.14	......	377.14

a This table supersedes that appearing in State Engineer's report for 1908, page 524, which is referred to incorrect gage datum.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River at N. Y. C. R. R. Bridge near Fox Ridge, Savannah P. O., N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	376.94	378.84	382.14	381.54	381.14	380.14	378.44	377.14	377.04	377.24	377.24	377.04
2	377.04	378.94	382.04	381.84	381.54	380.14	378.34	377.04	376.74	377.24	377.24	377.04
3	377.14	378.84	381.94	382.14	382.04	380.14	378.24	377.14	376.74	377.34	377.24	376.94
4	377.44	378.94	381.84	382.24	382.24	380.04	378.14	377.14	376.84	377.24	377.14	376.94
5	377.44	379.14	381.74	382.14	382.34	380.14	378.04	377.04	376.84	377.24	377.14	377.04
6	377.34	379.74	381.64	381.94	384.44	380.24	378.04	376.94	376.84	377.14	377.04	377.04
7	377.24	379.84	381.54	381.74	382.54	380.14	377.94	376.94	376.74	377.14	377.04	377.04
8	377.14	379.54	381.44	381.64	382.54	380.04	377.94	376.94	376.74	377.14	377.04	376.94
9	377.14	379.14	381.24	381.54	382.44	379.94	377.84	376.94	376.84	377.04	377.14	376.94
10	377.34	378.94	381.04	381.44	382.44	379.94	377.94	376.94	377.04	377.34	377.14	377.04
11	377.34	378.74	381.14	381.34	382.54	379.84	377.94	376.84	376.94	377.34	377.24	377.14
12	377.24	378.64	381.24	381.24	382.44	379.84	378.14	376.84	376.94	377.44	377.24	377.04
13	377.24	378.64	381.44	381.14	382.34	379.74	378.34	377.04	376.94	377.34	377.24	377.04
14	377.14	378.54	381.64	381.54	382.24	379.74	378.14	376.94	377.04	377.34	377.24	377.14
15	377.14	378.54	381.74	381.94	382.14	379.64	377.94	377.24	377.14	377.34	377.24	377.14
16	377.14	378.64	381.54	382.14	382.04	379.64	377.74	377.54	377.24	377.24	377.34	377.14
17	377.04	378.64	381.34	382.24	381.94	379.54	377.54	377.24	377.14	377.24	377.54	377.14
18	377.04	378.74	381.44	382.14	381.84	379.54	377.44	377.14	377.04	377.34	377.74	377.04
19	377.14	378.84	380.94	382.14	381.74	379.54	377.44	377.04	377.14	377.44	377.84	377.04
20	377.14	379.54	380.74	382.04	381.64	379.44	377.34	377.04	377.24	377.44	377.94	377.24
21	377.14	380.14	380.54	381.94	381.54	379.34	377.34	376.94	377.24	377.34	377.84	377.34
22	377.34	380.74	380.34	381.84	381.44	379.24	377.34	376.94	377.34	377.34	377.64	377.34
23	377.74	380.84	380.24	381.74	381.24	379.14	377.64	376.94	377.34	377.34	377.44	377.24
24	378.84	381.44	380.14	381.54	381.14	379.04	377.74	376.94	377.34	377.34	377.34	377.24
25	379.34	381.84	380.34	381.34	380.94	378.94	377.64	376.94	377.24	377.24	377.24	377.14
26	379.24	382.04	380.74	381.14	380.74	378.84	377.54	376.84	377.24	377.34	377.24	377.14
27	379.14	382.14	381.14	382.04	380.64	378.74	377.44	376.84	377.24	377.44	377.14	377.04
28	378.84	382.14	381.44	381.94	380.54	378.74	377.34	376.94	377.14	377.44	377.14	317.04
29	378.44	......	381.64	381.84	380.44	378.64	377.34	376.94	377.14	377.34	377.04	376.04
30	378.74	......	381.74	381.84	380.34	378.54	377.34	376.84	377.24	377.34	377.04	376.04
31	378.84	......	381.74	......	380.24	......	377.24	376.94	......	377.34	......	376.04

SENECA RIVER BELOW WEST MUD LOCK NEAR CAYUGA, N. Y.

A gage was established by this Department, October 10, 1905, at West Mud Lock, which is at the junction of Seneca river, Cayuga lake and Cayuga and Seneca canal. A vertical painted gage, reading from zero to 6 feet, is nailed to the docking at the left-hand end of the towing-path bridge crossing Seneca river at the foot of the lake. Readings are taken twice daily by A. Dumont.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River below West Mud Lock near Cayuga, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	381.36	381.26	383.76	383.56	383.86	383.36	382.06	381.46	381.86	381.76	381.46	381.11
2	381.46	381.66	383.66	383.46	384.16	383.26	382.06	381.56	381.66	381.76	381.56	381.11
3	381.36	381.36	383.66	383.46	384.36	383.26	382.06	381.56	381.56	381.76	381.41	381.06
4	381.36	381.36	383.56	383.56	384.46	383.16	381.96	381.66	381.86	381.76	381.36	381.06
5	381.36	381.36	383.56	383.66	384.36	382.96	382.06	381.66	381.96	381.76	381.26	381.16
6	361.26	381.46	383.46	383.56	384.26	383.06	382.06	381.56	381.86	381.76	381.36	381.06
7	381.26	381.56	383.46	383.46	384.36	383.06	381.96	381.66	381.76	381.71	381.51	381.56
8	381.26	381.66	383.56	383.66	384.36	382.96	381.96	381.56	381.76	381.76	381.66	381.06
9	381.36	381.66	383.46	383.66	384.26	382.86	381.86	381.66	381.06	381.71	381.41	380.76
10	381.46	381.56	383.66	383.76	384.36	382.96	381.86	381.66	381.66	381.71	381.66	381.06
11	381.36	381.56	383.76	383.86	384.26	382.86	381.96	381.56	381.76	381.96	381.41	381.06
12	381.26	381.56	383.76	383.76	384.26	382.96	382.06	381.66	381.86	381.91	381.31	380.96
13	381.36	381.66	383.66	383.96	384.36	382.96	381.96	381.86	381.96	381.81	381.46	381.16
14	381.36	381.66	383.56	383.86	384.36	383.06	381.86	382.06	381.86	382.01	381.36	381.06
15	381.46	381.56	383.66	383.86	384.26	382.96	381.86	382.36	381.76	381.76	381.26	381.01
16	381.36	381.56	383.66	383.86	384.16	382.86	381.76	382.06	381.76	381.76	381.31	381.01
17	381.56	381.76	383.56	383.76	384.16	382.76	381.66	381.86	381.86	381.66	381.21	381.06
18	381.46	381.86	383.46	383.76	384.06	382.66	381.56	381.86	381.86	381.66	381.11	380.96
19	381.36	382.16	383.36	383.86	384.06	382.56	381.46	381.96	*a*	381.71	381.36	380.96
20	381.26	382.46	383.26	383.66	383.96	382.56	381.46	381.86	*a*	381.51	381.36	380.96
21	381.36	382.46	383.36	383.66	384.06	382.46	381.36	381.86	*a*	381.96	381.16	380.96
22	381.46	382.76	383.26	383.76	383.96	382.56	381.26	381.76	382.16	381.71	381.31	380.96
23	381.36	382.86	383.16	383.66	383.86	382.46	381.36	381.86	381.86	381.51	380.96	380.96
24	381.26	383.16	383.26	383.56	383.76	382.46	381.36	381.76	381.86	381.46	381.01	380.96
25	381.26	383.36	383.16	383.66	383.76	382.36	381.36	381.66	381.86	381.56	381.06	380.91
26	381.36	383.46	383.26	383.66	383.66	382.26	381.26	381.56	381.66	381.61	381.16	380.91
27	381.36	383.66	383.36	383.96	383.86	382.16	381.36	381.66	381.76	381.51	381.16	380.96
28	381.36	383.56	383.26	383.56	383.66	382.06	381.46	381.66	381.76	381.46	381.21	380.96
29	381.46	......	383.36	383.66	383.46	382.16	381.36	381.56	381.86	381.31	381.01	380.96
30	381.36	......	383.46	383.86	383.56	382.16	381.46	381.56	381.86	381.46	381.16	380.96
31	381.36	......	383.46	......	383.46	......	381.46	381.96	......	381.51	......	381.01

a No record.

SENECA RIVER ABOVE WEST MUD LOCK NEAR CAYUGA, N. Y.

A gage was established above West Mud Lock near the foot of Cayuga lake in August, 1909, by L. S. Hulburd for this Department. A gaging station is also maintained below West Mud Lock and readings of both gages are taken twice each day by the same observer, A. Dumont. The gage below West Mud Lock shows the water-level in Cayuga lake. The gage above West Mud Lock shows the water-level in the Seneca river, or Cayuga and Seneca canal, at the east, or down-stream, end of the level extending from the lower lock at Seneca Falls to West Mud Lock. The gage consists of a 2-foot enameled steel section, reading to feet and hundredths and is attached vertically to the timber docking of the lock approach at the right-hand side of the canal just above West Mud Lock. The zero mark of the gage is at elevation 384.73, Barge canal datum.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River above West Mud Lock near Cayuga, N. Y.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1909					
1	....	385.68	385.91	386.35	386.11
2	....	385.63	385.98	368.38	385.98
3	....	385.53	385.91	386.38	386.05
4	....	385.58	386.08	386.35	386.03
5	....	385.63	386.18	386.33	385.81
6	....	385.58	385.98	386.28	385.98
7	....	385.58	385.98	386.13	386.05
8	....	385.63	385.95	386.38	386.15
9	....	385.63	386.03	386.38	386.13
10	....	385.63	385.88	386.51	386.01
11	....	385.58	385.95	386.43	386.05
12	385.93	385.53	386.18	386.45	385.81
13	385.98	385.58	386.15	386.31	386.01
14	385.93	385.58	386.21	386.15	386.15
15	385.98	385.63	386.23	386.35	386.11
16	385.98	385.53	386.23	386.38	386.13
17	385.98	385.58	386.01	386.21	386.08
18	385.98	385.63	386.21	386.11	386.08
19	385.93	*a*	386.11	386.11	385.88
20	385.93	*a*	386.31	386.11	385.95
21	385.98	*a*	386.41	385.91	386.03
22	385.93	385.91	386.38	386.03	385.98
23	385.93	386.11	386.25	386.11	386.03
24	385.93	385.88	386.15	386.05	386.08
25	385.73	386.03	386.35	385.98	385.73
26	385.93	386.31	386.41	385.95	385.73
27	385.73	385.98	386.35	386.18	385.95
28	385.73	385.95	386.25	385.81	386.08
29	385.68	385.93	386.31	386.18	386.05
30	385.68	386.23	386.35	386.03	385.75
31	385.73	....	386.23	......	386.20

a No record.

CAYUGA LAKE AT ITHACA, N. Y.

A gaging station was established by E. C. Murphy for the United States Geological Survey at the head of Cayuga lake, at Ithaca, August 6, 1905. A vertical gage board was used and was fastened to the wall of the breakwater about 150 feet from the lighthouse. This gage was maintained by the United States Geological Survey in coöperation with this Department, preceding 1909. During the year 1909 it was taken over by this Department and arrangements made to secure a continuous record and to have readings made daily.

The zero mark of the gage here used is determined from the United States Geological Survey datum and may differ slightly from Barge canal datum.

The record as far obtained during 1909 is given in the accompanying table.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Cayuga Lake at Lighthouse near Ithaca, N. Y.

DAY.	April.	May.	June	Oct.	Nov.	Dec.
1909.						
1	......	384.72	384.22	......	381.75	381.40
2	......	384.92	384.12	......	381.70	381.45
3	......	384.82	384.22	......	381.65	381.40
4	......	384.72	384.12	......	381.65	381.45
5	......	384.52	384.12	......	381.75	381.40
6	......	384.42	384.22	......	381.75	381.40
7	......	384.32	384.12	......	381.70	381.35
8	......	384.12	384.02	382.05	381.65	381.40
9	......	384.22	383.92	382.05	381.65	381.40
10	......	384.42	384.12	382.05	381.65	381.40
11	......	384.32	383.82	381.95	381.60	381.40
12	....	384.32	383.72	381.95	381.55	381.35
13	......	384.22	383.72	381.95	381.55	381.35
14	......	384.32	383.72	381.95	381.50	381.35
15	......	384.32	383.62	381.95	381.50	381.35
16	......	384.12	383.52	381.95	381.50	381.35
17	......	384.22	383.72	381.95	381.50	381.35
18	......	384.12	383.72	381.90	381.55	381.35
19	......	384.22	383.52	381.90	381.50	381.35
20	......	384.22	383.52	381.90	381.45	381.35
21	......	384.12	......	381.90	381.40	381.35
22	......	384.22	......	381.85	381.35	381.35
23	......	384.12	......	381.80	381.45	381.35
24	......	384.12	......	381.85	381.50	381.35
25	......	384.22	......	381.85	381.50	381.35
26	......	384.22	......	381.80	381.50	381.40
27	......	384.32	......	381.80	381.45	381.35
28	......	384.22	......	381.85	381.40	381.35
29	384.22	384.22	......	381.85	381.45	381.35
30	384.52	384.12	......	381.80	381.45	381.40
31	......	384.22	......	381.80	......	381.35

SENECA RIVER BELOW LOCK NO. 7 AT SENECA FALLS, N. Y.

A gage was established on Seneca river below the lower lock at Seneca Falls, August 7, 1909, by L. S. Hulburd for this Department. The gage consists of a 5-foot enameled steel section mounted on a ⅞ x 10-inch hardwood plank, spiked to timber docking at the down-stream end of the lower approach to the lock. The zero mark of the gage is at elevation 384.62, Barge canal datum. Readings are taken twice each day by Daniel Havens, by whom a record of the operation of the lock above the gage is also kept.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River below Lock No. 7 at Seneca Falls, N. Y.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.					
1	......	......	386.72	386.87	386.47
2	......	386.72	386.77	386.82	386.17
3	......	386.82	386.62	386.82	386.42
4	......	386.67	386.77	386.87	386.52
5	......	386.62	386.67	386.82	386.22
6	......	386.62	386.72	386.77	386.42
7	387.12	386.72	386.62	386.57	386.37
8	386.59	386.82	386.62	386.77	386.57
9	......	386.77	386.62	386.82	386.52
10	......	386.72	386.62	386.87	386.47
11	......	386.62	386.67	386.87	386.42
12	386.82	386.52	386.87	386.87	386.22
13	387.07	386.77	386.97	386.77	386.22
14	387.12	386.82	386.87	386.72	386.42
15	387.12	386.62	386.82	386.82	386.52
16	387.12	386.77	386.82	386.82	386.52
17	387.02	386.82	386.72	386.67	386.37
18	386.97	386.77	386.82	386.52	386.42
19	......	386.57	386.92	386.52	386.12
20	387.02	386.62	386.87	386.52	386.22
21	......	387.22	387.02	386.32	386.37
22	386.66	386.67	386.97	386.52	386.22
23	386.77	386.77	386.87	386.42	386.37
24	386.87	386.87	386.77	386.42	386.32
25	386.87	386.72	386.92	386.22	385.97
26	386.92	386.62	386.97	386.37	385.92
27	386.97	386.82	386.87	386.42	386.17
28	386.77	386.82	386.82	386.22	386.27
29	386.72	386.77	386.77	386.22	386.22
30	386.82	386.92	386.87	386.52	386.17
31	386.72	......	386.72	......	385.92

SENECA RIVER BELOW LOCK NO. 6 AT SENECA FALLS, N. Y.

The gage was established on Seneca river below Seneca Falls on November 16, 1909, by L. S. Hulburd for this Department. The gage consists of a 2-foot enameled steel section mounted on a ⅞ x 10-inch hardwood plank, spiked to the timber docking at the down-stream end of the lower approach to the lock. The zero mark of this gage is at elevation 391.62, Barge canal datum. Readings are taken twice each day by Daniel Havens.

Mean Daily Elevation of Water-surface of Seneca River below Lock No. 6 at Seneca Falls, N. Y.

DAY.	Nov.	Dec.
1909.		
1	......	392.24
2	......	392.24
3	......	392.25
4	......	392.28
5	......	392.12
6	......	392.26
7	......	392.23
8	......	392.24
9	......	392.26
10	......	392.24
11	......	392.21
12	......	392.12
13	......	392.21
14	......	392.27
15	......	392.26
16	392.36	392.28
17	392.37	392.26
18	392.26	392.21
19	392.30	392.10
20	392.20	392.22
21	392.12	392.14
22	392.22	392.04
23	392.20	392.06
24	392.22	392.08
25	392.17	391.86
26	392.20	391.85
27	392.14	392.10
28	392.12	392.08
29	392.24	392.04
30	392.26	392.06
31	......	392.08

SENECA RIVER ABOVE SENECA FALLS, N. Y.

A gage was established on Seneca river above the locks at Seneca Falls, August 6, 1909, by L. S. Hulburd for this Department. The gage is located in a dock slip a short distance above the up-stream end of the river wall, or long weir at Seneca Falls. It therefore shows the water-level in the river above the first diversion for canal or water power uses at this point. The gage consists of one 5-foot steel section, reading in feet and tenths, and one 2-foot section, reading in feet and hundredths. This was attached vertically to a hardwood plank and spiked to sheeting at the end of the slip. Current-meter measurements have been made at the highway bridge crossing the river a short distance up-stream from the gage. The conditions however, are not, such that a continuous record of the discharge can be obtained. The stage of the stream does not bear a constant relation to the amount of discharge, partly on account of the growth of aquatic foundation in the stream channel, but chiefly on account of leakage in the river wall or spillway and the drawing down of the water-level in the pond below the river wall. Owing to the varying amount of leakage taking place under these conditions, the flow of the stream varies even though the stage may remain approximately constant. The results of current-meter measurements which have been made are shown in the accompanying tables.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River above Seneca Falls, N. Y.

DAY.	Aug.	Sept.
1909.		
1	......	429.80
2	......	429.80
3	......	429.80
4	......	*a*
5	......	*a*
6	429.90	*a*
7	429.92	429.80
8	429.80	429.80
9	429.80	429.80
10	429.45	429.75
11	428.64	429.80
12	429.75	429.70
13	429.80	429.75
14	429.90	429.80
15	429.80	429.70
16	429.80	429.80
17	429.80	429.80
18	429.80	429.80
19	429.80	429.80
20	429.80	429.85
21	429.80	429.80
22	429.80	429.85
23	429.80	429.85
24	429.77	429.80
25	429.80	429.80
26	429.75	429.80
27	429.80	429.80
28	429.80	429.80
29	429.80	429.80
30	429.80	429.80
31	429.80	......

a No record.

Current-meter Discharge Measurements of Seneca River at Seneca Falls, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.	Remarks.
		Feet.	*Square feet.*	*Ft. per second.*	*Second-feet.*	
1909.						
Aug. 5...	Clark and Angus...	2.60	720	0.603	434	High bridge.
Aug. 6...	Clark and Angus...	2.60	893	0.489	437	Kingdom bridge.
Aug. 6...	Clark and Angus...	2.65	891	0.444	376	Kingdom bridge.
Sept. 9...	Clark and Robbins..	2.50	924	0.343	317	Kingdom bridge.
Sept. 28...	A. T. Clark........	2.50	868	0.409	355	Kingdom bridge.
Nov. 29...	A. T. Clark.......	2.60	866	0.384	333	Kingdom bridge.

Seneca River below Waterloo, N. Y.

A gage was established on Seneca river below the locks at Waterloo, August 11, 1909, by L. S. Hulburd for this Department. The gage, consisting of a 5-foot enameled steel scale divided to feet and tenths, is attached to the canal side of the first pier from the down-stream end of the tow-path bridge crossing the east, or lower branch of the river. The gage is read twice each day by Geo. W. Graves. The elevation of the zero mark of the gage is 428.49, Barge canal datum.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River below Waterloo, N. Y.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.					
1	......	430.49	430.49	430.29	429.99
2	......	430.54	430.49	430.29	430.04
3	......	430.59	430.39	430.29	430.04
4	......	430.54	430.49	430.24	430.04
5	......	430.44	430.54	430.24	429.69
6	......	430.49	430.39	430.29	429.99
7	......	430.59	430.39	430.14	429.99
8	......	430.54	430.39	430.14	430.04
9	......	430.54	430.39	430.24	429.99
10	......	430.54	430.34	430.24	429.94
11	429.64	430.54	430.39	430.24	429.94
12	430.24	430.44	430.34	430.14	429.59
13	430.39	430.49	430.44	430.24	429.79
14	430.39	430.44	430.39	429.99	429.94
15	430.19	430.39	430.39	430.09	429.94
16	430.39	430.44	430.39	430.14	429.94
17	430.34	430.44	430.24	430.09	429.84
18	430.39	430.44	430.39	430.14	429.84
19	430.39	430.49	430.34	430.14	429.59
20	430.44	430.54	430.39	430.14	429.79
21	430.49	430.54	430.39	429.89	429.84
22	430.39	430.59	430.39	430.09	429.89
23	430.39	430.44	430.34	430.09	429.84
24	430.49	430.54	430.19	430.04	429.84
25	430.44	430.54	430.29	429.94	429.64
26	430.59	430.39	430.34	429.99	429.49
27	430.54	430.49	430.24	430.04	429.74
28	430.39	430.59	430.24	429.69	429.84
29	430.54	430.54	430.29	430.04	429.84
30	430.49	430.54	430.39	429.99	429.74
31	430.44	......	430.09	......	429.74

Seneca River above Waterloo, N. Y.

A gage was establised above Lock No. 1 at Waterloo, August 11, 1909, by L. S. Hulburd for this Department. The gage consists of a 5-foot enameled steel section, reading to feet and tenths, and is mounted on a hardwood plank secured to the right-hand side of the timber work dividing the navigation canal from the water-power head-race. The gage is read twice each day by Geo. W. Graves. The elevation of the zero mark of the gage is 443.577.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River above Waterloo N. Y.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.					
1	......	444.43	444.23	444.43	444.23
2	......	444.33	444.28	444.38	444.28
3	......	444.18	444.33	444.43	444.18
4	......	444.23	444.18	444.43	444.18
5	......	444.43	444.18	444.28	444.68
6	......	444.33	444.23	444.33	444.23
7	......	444.08	444.33	444.73	444.18
8	......	444.03	444.28	444.53	444.18
9	......	444.08	444.48	444.33	444.13
10	......	444.13	444.48	444.38	444.23
11	444.98	444.13	444.38	444.38	444.08
12	445.03	444.48	444.33	444.48	444.48
13	444.73	444.38	444.23	444.33	444.33
14	444.63	444.18	444.43	444.63	444.18
15	445.03	444.73	444.38	444.53	444.08
16	444.93	444.38	444.33	444.28	444.13
17	444.63	444.28	444.68	444.48	444.23
18	444.63	444.08	444.38	444.38	444.13
19	444.63	444.23	444.23	444.33	444.58
20	444.58	444.28	444.18	444.28	444.23
21	444.53	444.23	444.23	444.58	444.08
22	444.68	444.23	444.28	444.28	444.13
23	444.68	444.23	444.43	444.28	444.13
24	444.53	444.23	444.63	444.13	444.03
25	444.53	444.23	444.43	444.58	444.43
26	444.38	444.38	444.23	444.43	444.48
27	444.33	444.23	444.58	444.33	444.03
28	444.53	444.03	444.53	444.78	444.18
29	444.53	444.33	444.38	444.28	444.08
30	444.38	444.23	444.28	444.23	444.13
31	444.43	......	444.68	......	444.13

SENECA RIVER BELOW REGULATION WORKS NEAR GENEVA, N. Y.

A gaging station was established on August 2, 1909, by L. S. Hulburd for this Department, on Seneca river just below the foot of Seneca lake and also below the Stoney gates constructed by the State to regulate the lake-level. The gage consists of a 5-foot enameled steel section mounted vertically on a hardwood plank and secured to the piling on the right-hand approach to the lock near the down-stream end. The datum of the gage is at elevation 446.04 and readings are taken twice each day by Wm. Van Kirk.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca River below Regulation Works near Geneva, N. Y.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.					
1	......	446.79	446.49	445.79	445.34
2	......	446.69	446.39	445.79	445.34
3	......	446.79	446.39	445.79	445.34
4	......	446.79	446.39	445.79	445.34
5	447.04	446.79	446.39	445.69	445.34
6	446.99	446.69	446.39	445.69	445.44
7	446.99	446.69	446.39	445.79	445.44
8	447.04	446.69	446.29	445.79	445.34
9	447.04	446.64	446.29	445.69	445.44
10	446.94	446.69	446.29	445.69	445.34
11	446.94	446.69	446.29	445.79	445.24
12	446.94	446.74	446.29	445.79	445.24
13	446.89	446.69	446.29	445.69	445.34
14	446.94	446.69	446.39	445.69	445.34
15	447.04	446.69	446.19	445.69	445.34
16	447.04	446.59	446.19	445.59	445.24
17	446.99	446.59	446.19	445.59	445.24
18	446.99	446.59	446.09	445.59	445.24
19	446.99	446.59	446.09	445.59	445.24
20	446.99	446.69	446.09	445.59	445.24
21	446.89	446.59	445.99	445.59	445.24
22	447.09	446.59	445.94	445.59	445.14
23	446.89	446.59	445.99	445.49	445.14
24	446.99	446.49	445.99	445.49	445.14
25	446.99	446.59	445.99	445.39	445.14
26	446.89	446.49	345.99	445.39	445.14
27	446.89	446.49	445.99	445.39	445.14
28	446.89	446.49	445.99	445.59	444.94
29	446.89	446.49	445.89	445.59	444.94
30	446.79	446.49	445.79	445.34	444.94
31	446.89	......	445.79	......	444.94

SENECA RIVER ABOVE REGULATION WORKS NEAR GENEVA, N. Y.

The gage was established August 2, 1909, by L. S. Hulburd for this Department at the foot of Seneca lake as described below. The gage is attached to the north side of a timber crib forming part of the lock approach, about 50 feet up-stream from the guard-lock and a like distance up-stream from the Stoney gates constructed to regulate the lake-level. This gate shows substantially the water-level in Seneca lake. It consists of a 5-foot enameled steel section mounted on a hardwood plank. The gage reads from zero to 5 feet by tenths and the zero mark is at elevation 445.94, Barge canal datum. Readings are taken twice each day by Wm. Van Kirk.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Seneca Lake above Regulation Works near Geneva, N. Y.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.					
1	......	446.69	446.39	445.69	445.24
2	......	446.59	446.29	445.69	445.24
3	......	446.69	446.29	445.69	445.24
4	......	446.69	446.29	445.69	445.24
5	447.04	446.69	446.29	445.59	445.34
6	446.99	446.59	446.29	445.59	445.34
7	446.99	446.59	446.29	445.69	445.24
8	447.04	446.59	446.19	445.69	445.34
9	447.04	446.54	446.19	445.59	445.24
10	446.94	446.59	446.19	445.59	445.24
11	446.84	446.59	446.19	445.69	445.14
12	446.94	446.54	446.19	445.69	445.14
13	446.89	446.59	446.19	445.59	445.24
14	446.94	446.59	446.29	445.59	445.24
15	447.04	446.59	446.09	445.59	445.24
16	447.04	446.49	446.09	445.49	445.14
17	446.89	446.49	446.09	445.49	445.14
18	446.89	446.49	445.99	445.49	445.14
19	446.89	446.49	445.99	445.49	445.14
20	446.89	446.59	445.99	445.49	445.14
21	446.79	446.49	445.99	445.49	445.14
22	446.99	446.49	445.99	445.49	445.04
23	446.79	446.49	445.89	445.39	445.04
24	446.89	446.39	445.89	445.39	445.04
25	446.89	446.49	445.89	445.29	445.04
26	446.79	446.39	445.89	445.29	445.04
27	446.79	446.39	445.89	445.29	445.04
28	446.79	446.39	445.89	445.49	444.94
29	446.79	446.39	445.79	445.49	444.94
30	446.69	446.39	445.69	445.24	444.94
31	446.79	......	445.69	......	444.94

CLYDE RIVER AND GANARGUA CREEK.

DESCRIPTION.

Clyde river joins Seneca river in the Montezuma marsh near the foot of Cayuga lake. Clyde river is formed by the junction of Canandaigua outlet and Ganargua creek, at Lyons. Its total length is about 20 miles and the greater portion of its course lies through a broad, marshy valley. Ganargua creek proper rises near Victor. Its course is northeasterly to Macedon. It then flows easterly, winding broadly through the system of duplicate valleys extending easterly from Macedon. The principal tributary of Ganargua creek is Mud creek, which rises in the hilly region near the head of Canandaigua lake and flows northward about 20 miles, entering Canargua creek at Victor. Ganargua creek is often called Mud creek throughout its course to Lyons. The valley through which it flows is, however, called Ganargua valley. The tributary drainage is of the characteristic glacial kame type and the tributaries are rather sparse, flowing oftentimes first north and then south between elongated hills, until they find their way to Canargua creek.

CLYDE RIVER AT CLYDE, N. Y.

A gage was established at Sodus street bridge in the village of Clyde, October 20, 1905, by E. V. R. Payne, of this Department. A gage of the box-and-chain type is used. The scale is divided decimally from zero to 8 feet. The elevation of water-surface, when the gage reads zero, is 380.00. The chain length is 22.09. The gage is located on the down-stream side of the central span of the bridge. The bridge has a total length between abutments of 174 feet. It is subdivided into 5-foot sections on the down-stream side for current-meter measurements, the initial point being the fact of the right-hand abutment. Readings are taken each day by J. F. Wickham.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Clyde River at Clyde, N. Y

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	382.00	382.30	386.10	385.10	384.90	*a*	381.35	381.45	381.60	381.55	**381.20**	**381.12**
2	381.90	382.20	384.90	384.80	386.00	381.90	381.38	381.45	381.55	381.55	**381.20**	**381.12**
3	381.10	382.10	384.30	384.30	387.40	381.85	381.35	381.45	381.55	381.50	**381.15**	**381.12**
4	381.10	381.90	383.80	383.90	387.10	381.80	381.35	381.45	381.50	381.45	**381.15**	**381.20**
5	381.00	381.60	383.60	383.70	386.40	382.05	381.45	381.55	381.45	381.45	**381.20**	**381.13**
6	381.00	382.10	383.40	383.60	386.10	382.05	381.15	381.55	381.45	381.45	**381.23**	**381.30**
7	381.00	384.10	383.30	383.50	385.80	382.00	381.35	381.55	381.40	381.40	**381.20**	**381.25**
8	381.00	383.40	383.20	383.30	385.60	381.85	381.15	381.50	381.35	381.45	**381.12**	**381.20**
9	381.50	382.60	383.20	383.10	385.50	381.75	381.25	381.45	381.45	381.45	**381.25**	**381.15**
10	381.30	382.10	383.80	382.90	385.30	381.70	381.35	381.45	381.45	381.50	**381.05**	**381.17**
11	381.40	381.90	385.30	383.10	385.30	381.75	381.25	381.40	381.45	381.55	**381.10**	**381.15**
12	381.50	381.80	385.40	382.00	385.30	381.85	381.55	381.50	381.55	381.55	**381.10**	**381.10**
13	381.50	381.80	385.00	382.00	384.80	381.70	381.60	381.45	381.65	381.55	**381.05**	**380.95**
14	381.40	381.80	384.20	383.70	384.40	381.65	381.45	381.45	381.60	381.55	**381.04**	**381.10**
15	381.30	381.90	383.60	385.30	384.20	381.55	381.45	381.45	381.55	381.45	**381.03**	**381.12**
16	381.60	382.30	383.50	385.90	384.60	381.55	381.45	381.55	381.60	381.35	**381.10**	**381.20**
17	381.50	381.80	383.10	385.60	384.90	381.50	381.45	381.65	381.45	381.35	**381.34**	**381.20**
18	381.50	381.60	382.50	385.10	384.60	381.45	381.45	381.80	381.45	381.15	**381.76**	**381.13**
19	381.40	381.50	382.80	384.70	384.10	381.35	381.55	381.65	381.55	381.15	**381.79**	**381.13**
20	381.40	382.00	382.60	384.00	383.70	381.35	381.55	381.65	381.60	381.20	**381.69**	**381.15**
21	381.30	384.10	382.40	383.80	383.60	381.35	381.54	381.65	381.65	381.25	**381.53**	**381.12**
22	381.30	384.10	382.20	383.70	383.20	381.35	381.45	381.65	381.75	381.20	**381.40**	**381.20**
23	381.90	384.80	382.20	383.40	383.10	381.35	381.55	381.55	381.65	381.30	**381.35**	**381.00**
24	383.30	386.10	382.10	383.00	383.00	381.35	381.55	381.55	381.65	381.30	**381.25**	**381.10**
25	383.60	388.40	382.60	382.90	382.80	381.25	381.55	381.65	381.65	381.25	**381.20**	**381.10**
26	382.70	388.90	384.30	382.30	382.60	381.25	381.45	381.70	381.55	381.40	**381.12**	**381.13**
27	382.10	388.70	384.50	382.70	382.50	381.28	381.55	381.70	381.45	381.40	**381.11**	**381.15**
28	381.80	387.50	384.80	382.70	382.50	381.45	381.55	381.65	381.45	381.40	**381.12**	**381.18**
29	382.20	......	385.30	382.70	382.40	381.45	381.55	381.55	381.55	381.40	**381.12**	**381.20**
30	382.60	......	385.40	382.30	382.30	381.45	381.55	381.55	381.55	381.15	**381.12**	**381.20**
31	382.60	......	385.20	......	382.30	......	381.45	381.55	......	381.20	.....	**381.20**

a Record missing.

Current-meter Discharge Measurements of Clyde River at Clyde, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
April 14..	J. P. Newton	3.92	676	2.25	1,522
May 12..	A. R. Patchke	5.30	859	2.37	2,042

CLYDE RIVER AT LYONS, N. Y.

A gage was established at Geneva street bridge in the village of Lyons, September 25, 1905, by this Department. The gage is of the weight-and-box type and is attached to the down-stream side of the bridge on the right-hand span. The gage is divided decimally from zero to 14 feet. The elevation of the water-surface, when the gage reads zero, equals 390.00. Standard chain length 18.72. Readings are taken at 1 P. M. each day by men from the Barge canal office at Lyons. The gage is located below the inflow of Canandaigua outlet. The down-stream side of the bridge is subdivided at 5-foot intervals for current-meter measurements, the initial point being the face of the left-hand abutment.

Mean Daily Elevation Water-surface (Barge Canal Datum) of Clyde River at Lyons, N. Y

DAY	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	390.70	391.40	395.00	395.00	393.90	391.90	391.00	391.00	391.60	391.50	391.30	390.90
2	390.70	391.30	393.50	394.50	395.20	391.90	391.00	391.00	391.50	391.50	391.20	391.00
3	390.70	391.30	393.10	394.10	398.40	391.70	391.00	391.00	391.50	391.60	391.00	391.10
4	390.70	392.40	392.80	394.50	397.00	391.60	391.00	391.10	391.40	391.60	391.10	391.00
5	390.70	393.10	392.60	394.30	395.40	392.10	391.00	391.00	390.90	391.60	391.20	390.70
6	390.80	393.60	392.40	394.10	395.30	392.30	391.00	390.90	391.20	391.60	391.30	390.70
7	391.00	393.60	392.70	393.90	395.80	391.90	390.90	391.20	391.50	391.60	391.30	391.30
8	391.00	393.20	393.00	394.20	395.50	391.80	390.90	391.20	391.60	391.60	391.30	391.00
9	390.90	392.60	393.00	394.40	394.60	391.60	391.00	391.40	391.30	391.40	391.10	390.90
10	390.90	392.20	394.70	394.80	394.60	391.50	391.20	391.40	391.60	391.30	391.20	390.80
11	390.80	392.20	396.40	394.00	394.80	391.80	391.20	391.30	391.40	391.40	391.10	391.10
12	390.80	392.50	394.80	393.00	394.70	391.80	391.40	391.40	391.60	391.90	391.10	391.20
13	390.80	392.90	394.30	394.40	393.90	391.70	391.40	391.50	391.60	391.60	391.20	391.30
14	390.80	392.40	393.80	395.80	394.00	391.60	391.30	391.50	391.50	391.40	391.10	391.30
15	390.80	392.00	393.20	397.10	394.70	391.20	391.20	391.40	391.70	391.50	390.90	391.40
16	390.80	391.60	392.80	396.00	395.00	391.50	391.10	391.40	391.50	391.40	391.00	391.30
17	390.80	391.30	392.50	394.90	394.60	391.30	391.00	391.80	391.80	391.20	392.10	391.00
18	390.80	391.10	392.30	394.50	394.10	391.20	391.00	391.80	391.60	391.90	391.40	390.80
19	390.80	391.00	392.20	393.90	393.50	391.20	391.30	390.70	391.40	391.80	391.30	390.90
20	390.80	393.10	392.20	393.40	393.10	391.10	391.30	391.60	391.60	391.40	391.40	390.80
21	390.80	393.70	392.20	393.50	393.00	391.10	391.30	391.30	391.40	391.50	391.50	390.90
22	391.50	394.60	392.20	393.20	392.90	391.20	390.80	391.40	391.40	391.70	391.30	391.00
23	392.30	395.50	392.20	392.90	392.70	391.10	391.50	391.60	391.70	391.60	390.80	390.40
24	393.80	399.25	392.20	392.60	392.50	391.30	391.50	391.70	391.90	391.50	390.80	390.70
25	394.80	400.10	393.30	392.50	392.30	391.00	391.60	391.70	391.70	391.30	390.90	390.70
26	393.00	398.15	393.80	392.30	392.10	390.90	391.60	391.60	391.90	391.60	391.10	390.60
27	391.90	397.50	394.20	392.10	392.10	391.10	391.30	391.80	391.70	391.30	391.00	390.50
28	392.30	396.50	395.20	392.50	392.10	391.30	391.70	391.60	391.30	391.50	391.00	390.90
29	392.40	......	396.20	393.20	392.10	391.30	391.50	391.70	391.40	391.10	391.00	390.90
30	392.40	......	395.90	393.80	392.00	391.10	391.20	391.90	391.60	391.20	390.95	390.70
31	392.10	......	395.50	......	392.00	......	391.10	391.80	......	391.20	......	390.60

Current-meter Discharge Measurements of Clyde River at Lyons, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
April 12	J. P. Newton	2.90	413	1.62	668
May 11	A. R. Patchke	5.18	817	1.83	1,494

Ganargua Creek north of Newark, N. Y.

A gaging station was established on the highway bridge 1½ miles up-stream from Newark railroad station, November 29, 1905, by James Kelly, for the Department. A box-and-chain gage, reading from zero to 13.9 feet, is attached to the down-stream side of the bridge. The elevation of water-surface, when the gage reads zero, is 406.00; chain length 15.02. Current-meter measurements were formerly made at this bridge. The bridge is located at a bend in the stream and the banks are overflowed during high water. Readings are taken about noon each day by Wm. J. Swartz. A bench-mark located on the west wing wall of Peck's highway bridge crossing the Erie canal 1.9 miles west of Newark consists of a chiseled square, the elevation of which is 449.767.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Ganargua Creek north of Newark, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec,
1909.												
1	407.8	408.4	406.5	409.9	412.3	408.1	407.6	407.9	407.2	407.5	407.6	407.5
2	407.8	408.4	409.8	409.8	412.8	408.1	407.6	407.9	407.2	407.6	407.6	407.5
3	407.9	408.4	408.9	409.7	412.4	408.0	407.5	407.8	407.3	407.5	407.7	407.6
4	407.9	408.4	408.6	409.6	411.4	408.2	407.4	407.8	407.4	407.6	407.6	407.6
5	408.0	409.0	408.8	409.6	411.0	408.2	407.4	407.3	407.3	407.6	407.8	407.5
6	408.1	409.9	408.9	409.6	411.6	408.1	407.5	407.7	407.3	407.7	408.0	407.5
7	408.2	409.6	408.8	409.5	411.5	408.1	407.5	407.6	407.2	407.7	408.1	407.4
8	408.4	409.3	408.7	409.5	411.3	408.2	407.4	407.4	407.2	407.8	408.0	407.5
9	408.4	409.1	408.9	409.6	411.0	408.2	407.4	407.2	407.1	407.9	408.0	407.5
10	408.3	409.0	409.2	409.7	410.8	408.2	407.3	406.9	407.1	408.0	408.1	407.4
11	408.2	408.9	410.9	409.8	410.6	408.1	407.3	406.7	407.0	408.0	408.1	407.4
12	408.2	408.8	409.8	410.2	410.5	408.1	407.5	406.5	407.2	408.0	408.1	407.5
13	408.1	408.6	409.1	410.6	410.3	408.0	407.7	406.4	407.2	408.1	408.3	407.5
14	408.1	408.5	408.8	412.0	410.2	408.1	407.8	406.3	407.3	408.2	402.2	407.6
15	408.0	408.4	408.7	412.4	410.2	408.0	407.7	407.0	407.4	408.3	408.0	407.6
16	408.0	408.3	408.7	411.1	410.0	408.0	407.6	407.5	407.4	408.5	408.2	407.7
17	408.0	408.3	408.8	410.6	410.4	418.0	407.6	408.0	407.6	408.6	408.2	407.8
18	407.9	408.2	408.8	410.3	410.0	408.1	407.7	408.5	407.6	408.5	408.3	407.7
19	407.9	408.1	408.9	410.1	409.6	408.0	407.7	408.8	407.6	408.3	408.3	407.8
20	407.8	408.2	408.9	409.8	409.2	407.9	407.6	408.6	407.7	408.1	408.5	407.8
21	407.8	408.3	408.8	409.4	408.9	407.9	407.6	408.4	407.7	407.8	408.0	407.8
22	407.8	408.7	409.1	409.0	408.9	407.8	407.6	408.2	407.7	407.7	408.3	407.7
23	407.9	409.4	409.4	408.7	408.7	407.8	407.7	408.0	407.6	407.5	408.4	407.7
24	408.8	414.7	410.0	408.4	408.6	407.9	407.7	407.7	407.6	407.7	408.6	407.7
25	410.0	415.4	410.4	408.5	408.6	407.8	407.6	407.5	407.4	407.8	408.4	407.8
26	409.6	414.5	410.8	409.0	408.4	407.7	407.6	407.2	407.5	407.8	408.3	407.9
27	409.2	413.2	411.9	409.2	408.3	407.8	407.7	407.0	407.4	407.7	408.0	407.8
28	408.7	412.0	411.6	409.9	408.3	407.7	407.7	406.9	407.5	407.6	407.8	407.7
29	408.6	......	411.0	410.7	408.2	407.7	407.6	407.2	407.6	407.7	407.8	407.7
30	408.5	......	410.6	411.6	408.2	407.6	407.7	407.4	407.5	407.6	407.6	407.6
31	408.5	......	410.2	......	408.2	......	407.7	407.3	......	407.5	......	407.6

Ganargua Creek near Palmyra, N. Y.

A gaging station was established at Harrison's mill between Palmyra and East Palmyra for this Department in 1907. The dam is of timber and has main crest of 44.2 feet in length obstructed by two piers and in addition a wing spillway 31.1 feet in length. The elevation of the water-surface deduced from the daily reading taken above the dam is shown in the accompanying table.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Ganargua Creek near Palmyra, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	421.88	422.23	422.83	423.33	424.03	422.28	421.53	421.73	421.73	421.73	421.93	422.03
2	421.93	422.23	422.73	423.28	425.23	422.13	421.63	421.58	421.58	421.68	422.03	421.93
3	421.83	422.18	422.93	423.13	423.83	422.03	421.78	421.53	421.13	421.68	422.08	421.78
4	421.53	422.18	422.73	422.93	423.43	422.18	421.63	421.48	421.88	421.63	422.13	421.68
5	422.28	422.28	422.43	422.93	423.23	422.23	421.63	421.43	421.58	421.78	422.08	421.53
6	422.23	423.68	422.63	422.83	423.23	422.23	421.58	421.78	421.83	421.83	422.13	421.68
7	422.13	423.23	422.93	423.03	423.58	422.28	421.48	421.68	421.58	421.93	421.73	421.68
8	422.13	422.98	422.68	422.93	423.33	422.08	421.73	421.48	421.73	421.53	421.93	421.73
9	422.23	422.68	422.93	422.68	423.08	422.13	422.28	421.63	421.78	421.63	421.83	421.83
10	422.13	422.63	424.03	422.63	423.13	422.23	421.83	421.73	421.23	421.73	421.93	421.48
11	422.13	422.43	423.83	422.78	423.33	422.33	422.03	421.53	421.13	421.83	421.73	421.33
12	422.08	422.38	423.48	422.63	423.13	422.28	422.03	421.48	421.23	421.83	421.73	421.18
13	422.03	422.43	423.43	422.53	422.93	422.23	421.93	421.43	421.03	421.98	421.83	421.43
14	422.03	422.33	422.88	424.43	422.83	422.23	421.93	419.63	421.83	421.98	421.78	421.73
15	422.23	422.33	422.88	424.03	422.88	422.18	422.03	420.78	421.73	421.93	421.83	421.88
16	422.13	422.23	422.83	423.43	423.48	422.18	422.13	420.93	421.83	421.98	422.03	421.93
17	422.13	422.13	422.53	423.33	423.23	421.93	422.03	422.03	421.78	421.98	422.58	421.98
18	422.18	422.08	422.73	423.13	423.08	421.93	421.93	421.93	421.73	421.83	422.68	422.03
19	422.03	422.08	422.63	423.08	422.88	421.93	421.98	421.68	421.68	421.93	422.78	421.68
20	422.08	422.73	422.63	423.08	422.88	421.98	421.93	421.68	421.63	421.98	422.48	421.68
21	422.03	423.08	422.63	422.93	422.63	421.93	421.78	421.63	421.58	421.93	421.93	421.63
22	422.23	422.98	422.53	422.93	422.53	421.98	421.93	421.58	421.73	421.93	421.93	421.58
23	422.93	423.63	422.53	422.88	422.53	421.93	422.03	421.53	421.78	422.03	421.98	421.63
24	423.73	426.23	422.48	422.83	422.53	422.03	422.13	421.68	421.83	422.03	421.93	421.58
25	423.28	425.43	423.23	422.73	422.43	421.73	421.93	421.78	421.73	422.08	421.88	421.63
26	422.63	424.03	423.33	422.43	422.33	421.83	421.98	421.98	421.73	422.03	421.73	421.63
27	422.58	423.43	423.78	422.43	422.33	421.68	421.93	421.93	421.63	421.98	421.83	421.58
28	422.58	423.03	423.83	422.68	422.23	422.03	421.83	421.78	421.73	421.78	421.68	421.53
29	422.43	......	423.93	422.63	422.33	421.83	421.88	421.53	421.33	421.83	422.03	421.53
30	422.28	......	423.63	423.03	422.28	421.53	421.88	421.33	421.63	421.93	421.98	421.63
31	422.23	......	423.43	......	422.23	......	421.68	421.53	......	421.83	......	421.58

CANANDAIGUA OUTLET.

DESCRIPTION.

Canandaigua lake occupies one of the elongated depressions extending in nearly a north and south direction in the central lake region of New York. The drainage tributary to the lake is chiefly short lateral streams from the steep slopes of adjacent hillsides. The outflow from the lake is regulated to some extent by gates constructed by the State. The lake is at elevation about 686. From the foot of the lake at Canandaigua the outlet flows a little north to Manchester, a distance of 7 miles. In this distance a fall of 100 feet occurs, which is chiefly concentrated at several water-power dams. From Manchester the stream flows easterly 12 miles and thence northeasterly 8 miles joining Ganargua creek at Lyons to form the Clyde river. In the easterly portion of its course the stream winds with large bends through a broad sloping valley of fertile land. The fall is mostly utilized at water-power dams. The tributary drainage is moderately rolling and is interpersed with glacial kames. These are lenticular hills extending usually in a north and south direction. At Phelps, Flint creek, which is the largest tributary, enters the outlet. Flint creek drains a valley similar to the adjacent lake basins. This valley is not at present occupied by a lake, but contains an extensive swamp, reaching several miles southward from Gorham.

CANANDAIGUA OUTLET AT ALLOWAY, N. Y.

This gaging station was established September 18, 1906, by F. T. Williams for this Department. It is located at a highway bridge crossing the stream 2½ miles above Lyons. The gage has a vertical scale divided decimally and reading from zero to 11 feet. It is attached to the down-stream face of the left-hand abutment of the bridge and has its zero mark at elevation 403.32. Current-meter discharge measurements are made from the down-stream side of the bridge, which has a span of 95 feet between abutments.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Canandaigua Outlet at Alloway, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	403.52	404.72	406.22	406.42	407.72	405.02	404.12	403.72	403.92	403.92	403.62	404.12
2	403.52	404.32	405.62	406.12	409.02	044.92	404.12	403.62	404.12	403.92	403.52	403.92
3	403.52	404.32	405.22	406.02	409.22	404.92	404.12	403.52	404.12	403.72	403.52	403.92
4	403.52	404.32	405.12	405.92	407.42	404.92	404.02	403.72	404.12	403.72	403.62	403.92
5	404.12	404.12	404.92	405.72	407.02	405.32	403.92	403.72	404.12	403.72	403.72	403.72
6	403.82	405.72	404.92	405.52	406.72	405.22	403.82	403.72	404.12	403.72	403.72	403.72
7	403.72	405.32	404.92	405.42	406.62	405.12	403.92	403.72	404.12	403.72	403.72	403.92
8	403.72	405.02	405.02	405.22	406.22	404.92	403.82	403.72	404.12	403.72	403.72	403.92
9	403.72	404.32	405.32	405.12	406.22	404.92	403.72	403.72	404.12	403.72	403.72	403.92
10	403.72	404.32	407.42	405.12	406.42	404.82	403.72	403.92	404.02	403.72	403.72	403.92
11	403.72	404.32	406.22	405.32	406.82	404.72	403.72	203.82	403.92	403.72	403.72	403.72
12	403.72	404.32	405.32	405.32	406.42	404.72	404.42	403.82	403.92	403.72	403.72	403.72
13	403.72	404.32	405.22	405.22	406.02	404.72	404.22	403.92	403.82	403.92	403.72	403.82
14	403.72	404.12	405.12	407.72	405.92	404.52	403.92	403.92	403.72	403.92	403.72	403.92
15	403.72	403.77	405.32	407.12	406.12	404.42	403.72	404.92	403.72	403.92	403.72	403.92
16	403.72	404.32	405.32	406.52	406.92	404.52	403.72	404.12	403.72	403.92	403.42	403.92
17	403.72	405.12	405.22	406.52	406.62	404.32	403.72	403.92	404.02	403.82	403.32	403.92
18	403.72	404.32	405.02	406.32	406.22	404.32	403.92	403.92	404.12	403.72	403.52	403.92
19	403.72	404.42	405.12	406.12	405.82	404.32	404.32	403.92	404.12	403.72	403.62	403.92
20	403.72	405.72	404.92	405.72	405.52	404.32	404.12	403.82	404.12	403.72	403.92	403.72
21	403.82	405.32	404.72	405.72	405.52	404.32	404.02	403.72	404.12	403.72	403.92	403.72
22	404.62	405.52	404.72	405.72	405.42	404.32	403.92	403.92	404.12	403.82	404.02	403.82
23	406.02	406.52	404.72	405.42	405.32	404.32	403.82	403.92	404.12	403.92	404.12	403.92
24	405.42	409.52	404.82	405.32	405.32	404.32	403.72	403.92	404.12	403.92	404.12	403.92
25	405.12	408.02	405.62	405.32	405.12	404.22	403.92	403.92	404.12	403.82	404.12	403.82
26	404.32	407.22	405.32	405.22	405.12	404.12	403.82	403.92	404.32	403.72	404.02	403.72
27	404.12	407.12	405.82	405.22	405.12	404.32	403.72	404.12	404.22	403.72	403.92	403.82
28	404.12	406.92	406.42	405.12	405.32	404.42	403.32	404.12	404.12	403.72	403.92	404.02
29	404.12	......	406.82	405.12	405.22	404.32	403.72	404.12	404.02	403.72	404.12	404.12
30	404.37	......	406.62	405.92	404.92	404.12	403.72	404.02	403.92	403.72	404.12	404.12
31	404.82	......	406.52	......	405.02	......	403.72	403.92	......	403.72	......	404.12

Current-meter Discharge Measurements of Canandaigua Outlet at Alloway, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
April 13	J. P. Newton	2.0	321	1.32	423
May 11	A. R. Patchke	3.4	442	2.11	933
Sept. 11	Clark and Robbins	0.55	182	0.41	73.8
Sept. 30	A. T. Clark	0.55	186	0.39	73.3

Mean Daily Discharge, Second-feet, of Canandaigua Outlet at Alloway, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	76	354	893	*a*1,000	*a*1,630	403	185	96	138	138	76	185
2	76	258	623	848	*a*2,250	379	185	76	185	138	61	138
3	76	258	482	800	*a*1,850	379	185	61	185	96	61	138
4	76	258	454	754	*a*1,450	379	161	96	185	96	76	138
5	209	209	403	665	*a*1,250	482	138	96	185	96	96	96
6	138	665	403	584	*a*1,100	454	117	96	185	96	96	96
7	117	513	403	547	*a*1,050	429	138	96	185	96	96	138
8	117	429	429	482	848	379	117	96	185	96	96	138
9	117	258	513	454	848	379	96	96	185	96	96	138
10	117	258	*a*1,500	454	*a*943	354	96	138	161	96	96	138
11	117	258	893	513	*a*1,150	330	96	117	138	96	96	96
12	117	258	513	513	*a*943	330	258	117	138	96	96	96
13	117	258	482	454	754	330	209	138	117	138	96	117
14	117	209	454	*a*1,600	710	282	138	138	96	138	96	138
15	117	128	513	*a*1,300	800	258	96	138	96	138	96	138
16	117	258	513	*a*1,000	*a*1,200	282	96	185	96	138	52	138
17	117	454	482	*a*1,000	*a*1,050	233	96	138	161	117	48	138
18	117	258	429	893	848	233	138	138	185	96	61	138
19	117	282	454	800	665	233	233	138	185	96	76	138
20	117	665	403	623	547	233	185	117	185	96	138	96
21	138	513	354	623	547	233	161	96	185	96	138	96
22	330	584	354	623	513	233	138	138	185	117	161	117
23	800	*a*1,050	354	513	482	233	117	138	185	138	185	138
24	547	*a*2,550	379	482	482	233	96	138	185	138	185	138
25	454	*a*1,800	623	482	429	209	138	138	185	117	185	117
26	258	*a*1,400	513	454	429	185	117	138	233	96	161	96
27	209	*a*1,350	710	454	429	233	96	185	209	96	138	117
28	209	*a*1,250	*a*1,000	429	482	258	96	185	185	96	138	161
29	209	......	*a*1,200	429	454	233	96	185	161	96	185	185
30	270	......	*a*1,100	710	379	185	96	161	138	96	185	185
31	379		*a*1,050	......	403		96	138	......	96	......	185
Mean	197	607	609	683	867	300	136	127	168	109	112	133

a Estimated.

Monthly Discharge of Canandaigua Outlet at Alloway, N. Y.
[Drainage area, 440 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	800	76	197	0.448	0.515
February	2,550	128	607	1.38	1.44
March	1,500	354	609	1.38	1.59
April	1,600	429	683	1.55	1.74
May	2,250	379	867	1.97	2.27
June	482	185	300	0.682	0.764
July	258	96	136	0.309	0.355
August	185	61	127	0.289	0.332
September	233	96	168	0.382	0.428
October	138	96	109	0.248	0.285
November	185	48	112	0.255	0.286
December	185	96	133	0.302	0.347

CANANDAIGUA LAKE AND OUTLET AT CANANDAIGUA, N. Y.

A gaging station was established by A. T. Clerk for this Department, September 10, 1909, at the foot of Canandaigua lake in the village of Canandaigua. The gage consists of two 5-foot enameled steel sections reading to feet and tenths, attached vertically to dock piling at shore end of the boathouse pier near the lake outlet. The zero mark of the gage has not been determined with reference to Barge canal datum. The gage is read twice each day by A. H. O'Reilly. This gage shows the water-level in Canandaigua lake. The outflow from the lake is controlled by gates. Meter measurements made from the bridge over outlet below Canandaigua are given in the following table.

Current-meter Discharge Measurements of Canandaigua Outlet at Canandaigua, N. Y.

DATE.	Hydrographer.	Reference point.[a]	Area of section.	Mean velocity.	Discharge.	Remarks.
		Feet.	*Square feet.*	*Ft. per second.*	*Second-feet.*	
1909.						
Sept. 10	Clark and Robbins.	5.9	110	0.72	79.1	Lake gage = 5.5.
Sept. 29	A. T. Clark	6.9	67.4	0.51	34.5	Lake gage = 5.3.

[a] Reference point is corner of right-hand abutment, up-stream side.

SKANEATELES LAKE.

SKANEATELES LAKE OUTLET AT WILLOW GLEN, N. Y.

Skaneateles lake outlet enters Seneca river above Cross lake, crossing the Erie canal at Jordan. The fall from the foot of the lake to this point is 465 feet.

The surface of the lake has an elevation of 865 feet above tide. The valley on each side of the lake has an average width of 2.5 miles, and in this distance there is a rise of 400 to 800 feet, the greater part of it being within a mile of the lake. The inflow to the lake is through numerous short lateral feeders flowing down these slopes. The drainage areas of the lake are shown below:

*Drainage areas of Skaneateles Lake.**

	Square miles.
Land surface above State dam at Skaneateles	60.25
Water surface of lake at Skaneateles	12.75
Total drainage area above foot of lake (water surface = 17.46 per cent)	73.00
Total area above Willow Glen weir	74.25
Area above Erie canal at Jordan	93.00

The station was established March 10, 1895. It is located in the village of Willow Glen, 1.5 miles below the foot of Skaneateles lake.

Observation is made of the daily discharge over a thin-edged weir, having a crest length of 27 feet, with two end contractions. The discharge is calculated from the observed depth on a stake set with its top at crest level, 5.2 feet up-stream from the weir, by means of the Francis formula, including corrections for end contractions and velocity of approach.

Since July 1, 1894, the water-supply of the city of Syracuse has been drawn from Skaneateles lake, and the amount of this diversion should be added to the discharge over Willow Glen weir to obtain the total run-off of the drainage basin. The calculated diversion, as determined from the record of gate openings and head at the inlet gates, using the formula for orifices with a constant coëfficient stated as 0.62 has been furnished by the city of Syracuse. The observations at the weir and gates were taken by Edward Conron. The 1909 record is not yet available.

A complete description of earlier gagings of this stream is contained in the report of the State Engineer of New York, supplement for 1902, pages 61–76.

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* Areas here given have been taken from proceedings in condemnation of water-powers on Skaneateles outlet. The lake and its tributary area are shown on the Skaneateles, Tully, Cortland and Moravia topographic atlas sheets of the United States Geological Survey.

NIAGARA RIVER DRAINAGE.

General Features.

Niagara river connects lakes Erie and Ontario. It receives the drainage from Tonawanda creek and adjacent smaller areas in New York.

Erie Canal at Change Bridge, Pendleton, N. Y.

A gage was established January 30, 1905, by this Department at Change bridge crossing the Erie canal just east of the junction of the canal with Tonawanda creek at Pendleton. A vertical gage with painted division marks is attached to the piling of the left-hand side of the stream near the down-stream side of the bridge. The gage reads from 12 to 18 feet. The reading of the gage, added to 560.00, gives the elevation of water-surface. Readings are taken each afternoon by Jacob Snell, Jr.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Erie Canal at Change Bridge, Pendelton, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	570.60	569.50	571.10	571.00	575.05	571.05	571.10	570.90	571.00	570.80	570.80	570.90
2	571.20	569.40	570.20	571.00	575.30	571.18	571.30	570.70	571.00	570.85	571.00	571.00
3	570.40	569.00	569.50	571.05	574.75	571.10	571.10	570.65	571.05	570.90	570.95	571.05
4	570.30	369.50	569.40	571.10	573.45	571.06	571.25	570.75	571.05	570.70	571.00	571.10
5	570.40	569.00	569.10	570.60	573.00	571.40	570.70	570.70	571.10	570.60	570.60	571.10
6	570.30	570.45	*a*	570.25	571.75	571.48	570.90	570.90	571.00	570.70	570.60	571.20
7	570.20	571.10	*a*	571.00	571.70	571.20	570.80	570.88	570.80	570.60	570.55	571.00
8	570.77	571.00	569.90	570.50	571.88	571.05	570.85	571.15	570.75	570.50	570.80	570.95
9	570.80	571.00	569.90	570.00	571.60	571.06	570.95	570.30	570.70	570.50	570.50	570.80
10	570.45	570.00	571.90	569.60	572.50	571.26	570.90	570.70	570.75	570.48	570.80	570.60
11	569.60	569.60	571.68	569.70	574.30	571.10	571.30	570.65	570.85	570.75	570.80	570.70
12	569.00	569.50	573.42	570.00	573.20	571.20	570.90	570.80	571.00	570.90	570.90	570.50
13	569.20	569.40	572.60	570.28	571.90	571.50	570.80	570.80	570.98	570.90	570.70	571.10
14	569.50	569.40	572.00	572.25	570.85	571.10	570.90	570.85	570.80	571.00	570.80	572.75
15	569.40	569.80	570.80	572.80	571.10	571.00	570.91	571.20	570.90	570.90	571.00	572.00
16	569.22	569.80	570.40	572.86	574.78	570.90	571.15	571.20	570.80	571.10	570.50	571.70
17	569.20	570.20	570.30	571.50	573.00	570.95	571.10	571.10	570.75	570.85	571.00	571.50
18	569.50	569.80	570.10	571.05	571.60	571.20	571.40	571.15	570.60	570.60	570.20	571.50
19	569.00	569.70	570.00	570.90	570.70	571.00	571.15	571.16	570.70	570.65	571.00	571.20
20	*a*	569.50	570.00	570.25	571.10	571.25	570.95	571.20	570.80	570.65	571.20	571.00
21	*a*	*a*	570.10	570.10	570.95	570.90	570.80	571.25	570.70	570.60	570.80	571.00
22	*a*	*a*	570.05	570.20	570.96	571.00	570.85	571.30	570.85	570.90	571.10	571.20
23	569.50	569.90	570.00	569.95	571.60	571.00	571.05	571.20	570.85	571.00	571.85	571.40
24	570.60	575.00	570.10	570.80	571.40	571.00	571.20	571.10	570.80	570.65	571.15	570.85
25	571.20	575.75	571.80	570.00	571.20	571.10	571.30	571.15	570.75	570.85	571.15	571.00
26	570.80	575.80	571.80	570.20	571.45	571.18	571.20	571.15	570.95	571.00	571.20	571.35
27	569.70	575.60	571.90	569.48	571.20	571.30	571.00	571.00	570.90	571.10	571.20	571.20
28	569.40	573.00	573.70	569.30	571.22	571.15	570.90	571.00	570.75	571.00	571.15	571.30
29	569.20	......	572.30	569.70	571.50	570.95	570.98	571.34	571.10	570.75	571.10	571.32
30	569.20	......	572.00	572.13	571.60	571.00	570.85	571.10	570.90	570.60	570.75	570.85
31	569.30	......	571.65	......	571.30	......	570.80	570.95	......	570.90	......	570.80

a No record.

Erie Canal at Main Street Bridge, Tonawanda, N. Y.

Between Pendleton and Niagara river Tonawanda creek is canalized to form the Erie canal. The State dam at Tonawanda controls the water stage in this level. A gage was established at

Delaware–Main street bridge, Tonawanda, January 23, 1905, by this Department. The gage is a vertical scale with painted 10th marks and is attached to the protection piling below the center pier of the bridge. The reading of the gage, added to 560.00, gives the water-surface elevation. Readings are taken each afternoon by Chas. Montage.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Erie Canal at Main St. Bridge, Tonawanda, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	*a*	569.40	569.80	570.40	572.80	571.40	571.50	*a*	571.40	571.10	571.20	571.00
2	*a*	569.65	569.60	570.40	*a*	571.40	571.50	571.10	571.40	571.00	571.10	571.00
3	*a*	569.10	569.42	570.40	572.60	571.40	571.50	571.00	571.40	*a*	571.20	571.00
4	570.50	569.10	569.20	*a*	572.30	571.40	*a*	571.00	571.35	571.00	571.20	571.00
5	570.60	569.50	569.00	570.15	571.60	571.40	571.40	571.00	*a*	570.60	570.40	*a*
6	570.70	570.00	569.00	569.90	571.10	*a*	571.30	571.00	571.30	570.70	570.40	571.00
7	570.70	*a*	*a*	570.60	571.10	571.40	571.20	571.20	571.10	570.70	*a*	571.20
8	570.80	569.70	569.90	570.05	570.80	571.40	571.18	*a*	571.15	570.80	570.50	571.00
9	570.80	569.60	569.60	569.80	*a*	571.50	571.20	571.50	571.20	570.70	570.40	571.00
10	*a*	569.40	571.20	569.65	571.10	571.50	571.30	571.50	571.30	*a*	570.40	571.10
11	570.00	569.30	571.40	*a*	572.60	571.60	*a*	571.60	571.35	571.10	570.40	571.20
12	569.00	568.80	571.40	569.80	572.10	571.60	571.30	571.50	*a*	570.70	570.50	*a*
13	569.50	569.00	571.00	569.85	571.80	*a*	571.10	571.50	571.40	570.10	570.70	571.10
14	569.70	*a*	*a*	571.55	571.60	571.60	571.30	571.50	571.18	570.20	*a*	571.20
15	569.60	569.70	570.40	571.45	571.80	571.35	571.25	*a*	571.20	570.40	571.00	571.00
16	569.60	569.60	570.10	571.45	*a*	571.35	571.25	571.60	571.15	570.60	571.00	571.00
17	*a*	569.90	569.80	571.40	571.80	571.35	571.30	571.60	571.15	*a*	570.40	571.00
18	569.00	569.60	569.60	*a*	571.40	571.35	*a*	571.60	570.95	571.20	570.80	571.00
19	568.60	569.40	569.80	570.60	571.20	571.35	571.50	571.55	*a*	570.70	571.40	*a*
20	567.80	568.70	569.60	570.10	571.00	*a*	571.35	571.50	571.08	570.80	571.40	571.00
21	567.30	*a*	*a*	569.80	571.10	571.35	571.20	571.60	571.08	570.60	*a*	570.80
22	567.60	569.25	569.60	569.70	571.15	571.35	571.20	*a*	571.15	571.20	570.90	570.90
23	569.00	569.20	569.60	569.60	*a*	571.50	571.25	571.60	571.15	571.10	571.10	570.80
24	*a*	572.10	570.80	569.60	571.80	571.20	571.50	571.50	571.05	*a*	571.10	570.90
25	570.40	572.45	570.90	*a*	571.55	571.30	*a*	571.40	571.00	571.20	571.10	570.80
26	570.50	571.80	570.90	569.95	571.75	571.50	571.45	571.40	*a*	571.20	571.10	*a*
27	569.60	571.00	571.40	569.20	571.50	*a*	571.35	571.40	571.20	571.20	571.20	570.80
28	569.40	*a*	*a*	568.95	571.40	571.60	571.20	571.40	571.30	571.10	*a*	570.80
29	569.20	......	571.40	569.75	571.40	571.50	571.20	*a*	571.35	571.00	571.00	570.80
30	......	......	571.05	570.80	*a*	571.50	571.15	571.40	571.20	571.20	571.00	570.70
31	*a*	......	570.75	......	571.40	......	571.15	571.40	......	*a*	......	570.70

a No record.

NIAGARA RIVER AT TONAWANDA, N. Y.

A gage was established January 23, 1905, by this Department, near the mouth of Tonawanda creek and below the State dam. The readings of this gage, added to 560.00, show the elevation of Niagara river at its junction with Tonawanda creek. The gage is a vertical scale graduated to feet and tenths from zero to 10 feet and is attached to the protection piling at the right-hand end of the draw span of the New York Central bridge in the lumber district at Tonawanda.

During 1909 the record at this station has been obtained by means of a recording gage and is in the form of weekly graphical records.

HUDSON RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The principal sources of Hudson river lie in the wildest portion of the Adirondack mountains, in Essex county, northeastern New York. A number of branches, any one of which might possibly be considered the main stream, form its upper waters; but if the highest collected and permanent body of water be assumed as the true head, then the source of the Hudson becomes Lake Tear-of the-Clouds, which lies at an elevation of 4,322 feet bove tide, in the center of the triangle formed by Mounts Marcy and Skylight and Gray Peak.

The river flows rather irregularly southward until it reaches the northern boundary of Saratoga county, when it makes a sharp turn and flows eastward for about 12 miles by general course, passing through the mountains and forming, as it cuts across the rocky strata, several notable waterfalls. At Sandy Hill, just below Glens Falls, it makes another abrupt turn and flows southward: continuing in this direction until it empties into New York bay.

From Lake Tear-of-the-Clouds to the mouth of the river the distance by water is probably about 300 miles. The totol area drained is 13,366 square miles. The river is tidal to Troy, which is also at the head of navigation.

The tributaries of the Hudson are numerous, and many of them are large and important. Indian river, Scroon river, and Sacandaga unite with the main stream above Glens Falls, and between the latter point and Troy Hudson river receives Batten kill, Fish creek, Hoosic river and the Mohawk. The tributaries below Troy include Catskill, Esopus and Rondout creeks and Wallkill river from the west, and Kinderhook creek, Jansen kill, Wappinger creek, Fishkill creek and Croton river from the east.

LOWER HUDSON RIVER DRAINAGE BASIN.

DESCRIPTION.

Below Troy the bed of Hudson river is depressed below tidewater level. The stage of the stream is controlled by tidal action, by the inflow of the main stream and by the lateral drainage jointly. The drainage tributary to this portion of the stream includes the south and east slopes of the Catskill mountain region on the west bank and a series of streams heading near the New York–Massachusetts and the New York–Connecticut lines on the east. These streams include the principal present and proposed sources of municipal water-supply of New York city.

KINDERHOOK CREEK, AT ROSSMAN, N. Y.

A gaging station was established at Rossman highway bridge on Kinderhook creek, March 17, 1906, by Robert E. Horton. This gaging station is maintained by the United States Geological Survey in coöperation with this Department. The gage is of the weight-tape-and-reel pattern, and readings are taken morning, noon and evening by Wesley Ham.

The channel is rock, and is nearly straight for some distance above and below the gage.

The station is about one-quarter mile below a dam, and very little ice obstruction occurs except in extreme cold weather.

A description of Kinderhook creek, with the results of gagings made in 1892–1894, may be found in the report of the State Engineer and Surveyor for 1902, Supplement, pages 252–256.

Mean Daily Gage Height, in Feet, of Kinderhook Creek at Rossman, N. Y.

DAY	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	26.34	27.29	27.73	28.56	28.12	26.92	26.78	26.40	26.32	26.66	26.56	26.60
2	26.38	27.19	27.70	28.36	28.32	26.88	26.81	26.45	26.37	26.62	26.54	26.58
3	26.47	27.23	27.66	28.42	28.15	27.03	26.74	26.31	26.42	26.46	26.48	26.59
4	26.59	27.35	27.67	28.37	28.27	27.04	26.50	26.38	26.39	26.53	26.56	26.56
5	26.83	26.94	27.59	28.23	28.37	26.99	26.46	26.61	26.37	26.54	26.63	26.43
6	29.61	28.42	27.27	28.27	28.18	26.76	26.62	27.22	26.37	26.50	26.43	26.55
7	28.19	28.56	27.41	28.72	28.03	26.91	26.59	26.84	26.39	26.48	26.29	26.49
8	28.72	27.96	27.43	28.86	27.90	27.10	26.54	26.60	28.41	26.50	26.40	26.58
9	27.81	27.84	27.29	28.42	27.80	26.81	26.62	26.64	26.47	26.52	26.56	26.56
10	27.52	27.86	27.93	28.22	27.66	26.90	26.51	26.57	26.44	26.46	26.46	26.57
11	27.46	26.36	29.54	27.89	27.55	27.06	26.27	26.62	26.51	26.43	26.41	26.46
12	27.52	27.88	28.41	27.82	27.52	26.93	26.55	26.48	26.32	26.48	26.44	26.25
13	27.17	27.64	28.25	27.75	27.46	26.66	26.58	26.34	26.48	26.49	26.35	26.57
14	27.81	27.56	27.88	28.18	27.35	26.76	26.52	26.45	26.48	26.51	26.27	26.70
15	27.36	27.54	27.86	30.22	27.35	26.89	26.54	26.38	26.49	26.50	26.40	26.86
16	27.53	27.72	27.79	29.64	27.38	26.85	26.55	26.60	26.50	26.50	26.41	26.88
17	27.56	28.14	27.72	28.95	27.52	26.84	26.53	26.52	26.42	26.38	26.49	26.85
18	27.48	27.71	27.61	28.58	27.60	28.21	26.40	26.62	26.36	26.50	26.35	26.80
19	27.45	27.65	27.52	28.31	27.55	27.93	26.22	26.59	26.31	26.40	26.36	26.47
20	27.41	34.14	27.56	28.15	27.34	27.52	26.42	26.59	26.31	26.37	26.36	26.48
21	27.32	30.30	27.36	28.03	27.19	27.38	26.46	26.70	26.26	26.40	26.37	26.40
22	27.17	29.18	27.42	27.92	27.28	27.15	26.43	26.42	26.29	26.47	26.64	26.44
23	26.92	28.57	27.35	27.92	27.30	27.03	26.44	26.56	26.27	26.46	26.57	26.56
24	27.40	28.67	27.31	27.99	27.16	27.12	26.45	26.50	26.41	26.30	26.56	26.53
25	28.18	30.05	27.48	27.74	27.01	27.18	26.37	26.46	26.31	26.59	26.42	26.49
26	28.11	28.50	29.59	27.80	26.92	26.99	26.56	26.52	26.30	26.67	26.49	26.40
27	27.89	28.42	28.68	27.78	26.97	26.72	26.42	26.38	26.42	26.63	26.58	26.62
28	27.66	28.27	28.82	27.66	27.12	26.90	26.48	26.37	26.66	26.61	26.37	26.69
29	27.86	......	29.37	27.90	27.35	27.02	26.52	26.42	27.00	26.58	26.61	26.86
30	27.34	......	28.78	27.84	27.35	26.83	26.51	26.37	26.78	26.56	26.56	26.83
31	27.68	......	28.58	......	27.22	......	26.51	26.42	......	26.44	......	26.49

NOTE.— This stream rarely freezes over at the gage. It is probable, however, that the relation of stage to discharge was more or less affected during the winter months for brief intervals, due to backwater from ice conditions below the gage.

Current-meter Discharge Measurements of Kinderhook Creek at Rossman, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
		Feet.	*Feet.*	*Square feet.*	*Second-feet.*
1909.					
Feb. 28..	D. M. Wood	28.11	154	349	960
June 8..	Covert and James	26.86	155	138	210
Oct. 27..	Covert and Hoyt	26.67	141	99	124

CATSKILL CREEK AT SOUTH CAIRO, N. Y.

The basin of this stream receives the run-off from the north slope of the Catskill range and lies, for the most part, in the timbered highlands of Greene county. The slopes are precipitous, there are no lakes, and the amount of artificial storage is small. The underlying rock formation is chiefly Devonian shale. The topography of the area is shown on the Durham, Coxsackie and Catskill sheets of the United States Geological Survey topographic atlas. The stream flows over a rock bed through much of its course and enters tide-water of Hudson river at Catskill.

The gaging station was established July 4, 1901, by Robert E. Horton and George B. Hollister, and is located at the highway bridge in the village of South Cairo. It is maintained by the United States Geological Survey in coöperation with this Department.

The stream channel is rock, covered in some places with earth. The bridge has a single span of 194.5 feet between abutments.

The stage of the stream is observed each morning and night from a standard chain gage, which is attached to the bridge and the elevation of which is referred to a circle near the outer corner on the up-stream side of the bridge-seat on the right-hand abutment. The elevation of the bench-mark is 21.29 feet above gage datum.

This station has been maintained by the board of water supply of New York city during 1907–8–9.

Data for 1909 is not at present available.

ESOPUS WEIR NEAR OLIVE BRIDGE, N. Y.

The wier is constructed of concrete, having a cross-section similar to that experimented on in the hydraulic laboratory at Cornell University by the United States Geological Survey, in Series 30, described in Water Supply and Irrigation Paper No. 130-[a].

The average height of this weir above the rock on which it is founded for its entire length is 7.54 feet; length between abutments, 193.90 feet. In order to form a channel of approach, the abutments have been extended up-stream at right angles with the axis of the weir for a distance of 16 feet and the area of the channel of approach below the crest of the weir is 1,462 square feet. The abutments extend 14 feet above the level of the crest and it is estimated that a flow of 40,000 cubic feet per second can be taken care of.

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[a] "Weir Experiments, Coefficients and Formulas," by Robert E. Horton.

Measurements of the head on the weir are made in a well 24 inches in diameter, situated 53 feet up-stream from the crest of the weir. Water is admitted to this well through a ¾-inch pipe extending 16 feet out into the stream, in which, spaced 6 inches apart, are ⅛-inch holes bored vertically through the pipe. The center of this pipe is placed 18 inches above the bed of the stream. A continuous record of the head at this point is kept by means of a Friez automatic water-stage register, geared 1 to 1 and running twenty-four hours. Observations of the flow were first begun on October 17, 1906, though the automatic gage register was not installed until December 5. Prior to this latter date heads were read three times daily and reduced in the usual manner.

Computations of the discharge over this weir are made from a formula which has been deduced from the results of the experiments made by the United States Geological Survey and referred to above. During the winter the ice which forms between the wing walls that form the channel of approach is kept away so that there may be no change in the conditions of flow due to this cause.

The watershed of Esopus creek above the weir is 239 square miles, as measured on the topographic maps of the United States Geological Survey.

The data for 1909 is not at present available.

RONDOUT CREEK AT ROSENDALE, N. Y.

The Rosendale gaging station is located on the highway bridge and was established by Robert E. Horton for the United States Geological Survey in coöperation with the New York City Water Supply Departments on July 6, 1901; it was assumed by the Board of Water Supply of the city of New York on June 1, 1907, at which time a new standard Board of Water Supply chain gage was put in to replace the old one.

Measurements are taken from the bridge at high and medium stages and by wading at a point about 1,000 feet below the bridge at low stages.

The gage is located on the down-stream side of the bridge in the middle panel. The length of the chain from end of weight to marker is 34.53 feet.

The bench-mark is a circular cut on rock on up-stream corner, right abutment. The elevation is 33.56 above the datum.

The water is confined to one channel under the single span steel bridge, which is 135.7 feet between abutments, at all stages.

A portion of the water of the creek is diverted by a dam below High Falls and sent through the Delaware and Hudson canal, and is discharged into the creek below the gaging station. At Rock Locks, which is about 1½ miles below Rosendale, there is an overflow weir, from which the approximate discharge of the canal may be obtained. The weir, which has a crest of 3.8 feet, is located at the left end of the lock and is equipped with a standard Board of Water Supply staff gage.

The data for this station for 1909 is not at present available.

MOHAWK RIVER DRAINAGE BASIN.

DESCRIPTION.

Mohawk river, the largest of the tributaries of the Hudson river, rises in the sandy hills south of Boonville, in western New York, about 40 miles from the east end of Lake Ontario. Its uppermost tributaries are fed by large springs, and in addition the stream receives considerable water brough in from the adjacent Black river drainage basin for the supply of the Black River and Erie canals.

The Mohawk flows southward until it reaches the city of Rome, at which point it turns to the east, flowing across the state in a course a little south of east until it enters the Hudson at Cohoes, a few miles above Troy. It has a length by actual course of 140 to 145 miles, and a drainage area, measured at the mouth, of about 3,468 square miles.

The immediate valley of the Mohawk is broad and open, at many places a mile or two in width, from which there is a rise, usually gradual but sometimes abrupt, to hills which attain altitudes several hundred feet above the stream. Toward the mouth of the river the valley becomes more contracted and the meadows disappear. The flats which border the stream have a rich alluvial soil; the more elevated lands are covered with gravelly loam and clay.

Above Rome the Mohawk flows through a deep gorge in shale rock; from Rome eastward to Little Falls the valley is deeply filled with alluvial deposits, and the flood plains on either side become submerged during freshets, thus acting to some extent as storage reservoirs. At Little Falls the river cuts through a rocky gorge, whose walls rise precipitously 500 or 600 feet.

Below Rome the fall of the river is small and rather uniform, being made up of long quiet reaches with slight riffles; but at Little Falls this uniformity is broken, and the stream descends in a succession of falls about 45 feet in 2,500. The average fall between Rome and the lower aqueduct at Crescent, a distance of 110.7 miles, is 2.43 feet per mile; thence to the level of slack water above Troy dam there is a farther descent of 149.5 feet in 4.4 miles, but of this 105 feet is included within the improved power at Cohoes.

The principal tributaries of the Mohawk below the source are, successively, Oriskany, West Canada, East Canada and Schoharie creeks.

The Erie canal runs parallel to the Mohawk through most of its course below Rome and derives a part of its water-supply from the river. Feeder dams for purposes of diversion are located on the river at Delta, Rome, Little Falls, Rocky Rift and Rexford Flats. A dam at Oriskany creek also diverts into the canal a portion of the flow of that tributary, as well as waters brought into the Mohawk basin from storage reservoirs located in the upper drainage basin of Chenango river near Hamilton, N. Y. There is also a diversion dam near the mouth of Schoharie creek, the largest tributary of the Mohawk.

MOHAWK RIVER AT WATERFORD, N. Y.

The gage is attached to the coffer-dam across the lower end of Barge canal lock No. 2, about 50 feet north of the Fourth street bridge, and adjacent to the present Waterford side-cut canal. This gage replaces the one formerly attached to the old wooden highway bridge across the Hudson river at Waterford, which was destroyed by fire July 10, 1909, necessitating the removal of the gage to the location described.

Mean Daily Gage Height, in Feet, of Mohawk River at Waterford, N. Y.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.												
1	*a*	15.90	15.05	20.50	18.15	15.00	15.40	15.10	15.30	15.85	19.25	15.20
2	*a*	15.75	15.05	19.40	18.60	15.10	15.35	15.20	15.25	15.65	16.35	15.10
3	*a*	15.60	15.20	18.10	18.05	15.00	15.50	15.25	15.15	15.15	16.95	15.00
4	*a*	15.55	15.05	17.35	17.60	15.00	15.80	15.60	15.05	15.25	18.50	14.80
5	*a*	15.55	14.90	17.05	18.10	15.00	15.20	15.55	16.05	16.15	17.80	14.70
6	*a*	15.50	15.10	17.05	18.10	14.90	15.60	15.40	16.00	16.30	17.35	14.60
7	*a*	15.55	15.35	17.00	18.15	15.40	15.40	15.30	16.60	15.90	20.70	14.60
8	*a*	15.60	15.40	16.70	18.05	15.80	15.85	15.15	16.15	15.85	23.10	14.60
9	*a*	15.55	15.40	16.25	17.20	15.60	14.65	14.60	16.40	16.95	20.55	14.70
10	*a*	15.60	15.30	16.20	16.95	15.20	14.20	14.65	15.50	17.30	19.55	15.50
11	*a*	15.55	15.30	16.10	16.55	14.80	14.20	14.80	15.00	16.85	18.60	21.75
12	*a*	15.55	15.25	16.40	16.50	14.60	14.80	15.25	15.70	16.65	17.65	19.50
13	*a*	15.50	15.15	16.75	16.30	14.60	15.30	15.25	16.40	16.45	17.00	17.90
14	*a*	15.60	15.50	17.20	15.90	14.60	15.30	15.25	16.10	16.15	16.60	17.10
15	15.80	15.50	17.25	16.95	15.70	14.50	15.05	15.20	15.20	15.75	16.25	17.10
16	15.85	15.50	18.30	16.35	15.70	14.50	14.65	15.20	15.20	15.45	15.95	16.50
17	15.85	15.50	18.30	16.20	15.85	14.30	14.40	15.25	15.25	15.20	15.75	16.20
18	16.25	15.60	18.20	16.00	15.80	14.30	15.25	15.30	15.30	15.45	15.60	16.25
19	16.20	15.60	18.20	15.80	15.80	14.15	15.05	15.40	15.40	14.75	15.35	15.80
20	16.75	15.55	18.00	15.70	15.80	14.30	14.95	15.40	15.40	14.60	15.20	15.75
21	17.55	15.60	18.25	15.60	15.60	14.45	15.30	15.20	15.20	14.60	15.15	15.65
22	16.25	15.55	17.65	15.40	15.20	15.05	15.25	14.95	13.90	14.70	15.10	15.95
23	15.50	15.60	17.55	15.25	15.10	15.20	15.00	14.95	14.35	14.65	15.20	15.70
24	16.20	*a*	19.40	15.80	15.05	15.25	14.90	15.00	14.45	14.60	15.20	17.85
25	15.80	*a*	18.95	18.75	15.00	14.70	15.25	15.00	14.45	14.55	15.20	19.35
26	15.70	*a*	18.30	18.15	15.00	14.30	15.35	14.95	14.60	14.40	15.20	18.35
27	15.90	*a*	17.75	20.60	15.10	14.80	15.50	15.05	14.55	14.45	15.20	18.00
28	16.25	*a*	18.70	19.50	15.60	14.90	15.60	15.10	14.50	15.10	15.20	17.50
29	25.16	......	20.40	18.95	15.70	14.90	15.40	15.00	14.90	18.95	15.20	18.70
30	16.00	......	20.80	18.35	15.50	*a*	15.00	15.00	15.50	18.95	15.35	17.75
31	15.85	......	21.05	......	15.20	......	14.80	15.00	......	17.55	......	17.90

a No record.

Mean Daily Gage Height, in Feet, of Mohawk River at Waterford, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	Dec.
1908.						
1	17.75	16.05	15.65	19.40	19.30	....
2	17.30	16.15	15.45	18.80	20.80	....
3	16.75	15.00	15.45	18.55	*b*	....
4	16.45	15.15	16.00	17.75	......	....
5	17.05	14.95	15.85	17.00	......	....
6	17.25	13.90	15.85	16.95	......	....
7	16.40	14.60	15.70	17.30	......	....
8	17.10	14.30	15.70	17.60	......	....
9	17.15	14.90	15.50	19.90	......	....
10	17.10	15.15	15.80	19.65	......	....
11	16.25	14.55	15.70	19.40	......	....
12	16.30	14.50	15.60	19.40	......	....
13	16.95	14.65	16.80	18.95	......	....
14	16.80	14.80	19.50	18.50	......	....
15	17.50	17.85	19.95	18.25	......	....
16	17.05	*a*	20.35	18.00	......	....
17	16.80	*a*	18.70	18.00	......	....
18	16.50	*a*	17.65	17.65	......	....
19	16.20	*a*	17.15	17.60	......	....
20	16.30	*a*	16.80	17.95	......	....
21	15.65	17.30	16.45	17.75	......	....
22	15.55	17.00	16.35	17.15	......	....
23	15.55	16.60	16.70	17.00	......	....
24	15.80	16.15	18.15	16.85	......	....
25	15.60	15.80	19.25	17.60	......	....
26	15.15	15.70	18.00	18.05	......	....
27	15.15	15.55	18.85	18.75	......	15.30
28	15.50	16.55	19.60	19.35	......	15.30
29	15.25	16.05	21.25	19.45	......	15.25
30	15.15	......	21.30	19.15	......	15.05
31	14.90	......	20.45	......	......	15.15

a No record.
b For record, May 3 to December 26, inclusive, see Hudson river at Waterford, p. 475.

Mean Daily Gage Height, in Feet, of Mohawk River at Waterford, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	15.00	16.60	17.55	17.05	18.25	15.10	......	13.80	14.25	15.05	15.30	15.70
2	15.15	16.50	16.85	17.50	19.45	14.85	......	13.70	13.70	15.05	15.40	15.65
3	15.20	16.35	16.50	17.60	18.95	14.55	......	13.70	14.05	15.25	15.30	15.45
4	15.30	16.25	16.25	18.15	18.65	14.50	......	13.70	14.10	15.35	15.10	15.45
5	15.30	15.90	16.00	18.05	18.70	12.75	......	13.80	14.40	15.10	14.65	15.40
6	17.10	16.70	15.55	18.25	18.35	*b*	......	13.80	14.35	15.10	14.70	15.40
7	18.65	19.75	15.50	19.60	18.05	......	......	13.80	14.65	15.00	15.40	15.40
8	18.10	18.70	15.35	21.20	18.15	......	......	13.80	14.60	14.70	15.10	15.35
9	17.35	18.15	15.10	21.10	18.35	......	......	13.65	14.80	14.85	14.80	15.25
10	16.90	17.70	15.10	19.95	18.25	......	......	13.60	15.15	15.00	14.75	14.95
11	16.50	17.50	16.55	18.80	18.70	......	13.60	13.55	15.30	14.90	14.95	15.10
12	16.15	17.45	16.10	18.00	19.30	......	13.70	13.60	15.15	14.70	15.00	15.10
13	15.80	17.30	16.00	17.70	19.20	......	13.45	13.30	15.00	13.50	15.20	15.05
14	15.80	17.20	16.75	18.70	18.40	......	13.30	13.55	15.05	15.75	15.50	15.00
15	15.90	17.30	16.55	23.35	17.60	......	13.50	13.60	14.90	13.75	15.45	14.90
16	16.55	17.40	16.40	23.45	17.25	......	13.50	13.65	14.70	14.10	15.35	15.05
17	15.10	17.65	16.35	22.55	17.70	......	13.50	13.65	14.50	15.00	15.00	15.15
18	15.60	17.85	16.15	21.00	17.55	......	13.65	13.35	14.95	14.70	14.00	15.05
19	15.25	17.55	14.90	20.55	17.30	......	13.45	14.30	14.90	14.20	15.20	15.30
20	15.25	22.70	14.95	20.20	16.75	......	13.40	14.40	14.95	14.45	15.50	15.10
21	15.25	20.95	15.05	20.50	16.35	......	13.55	14.30	14.90	15.20	15.45	14.95
22	15.05	19.35	15.05	19.80	16.20	......	13.50	14.30	15.00	15.00	15.35	14.80
23	15.15	18.80	15.00	19.25	16.20	......	13.55	14.10	13.75	15.20	15.40	14.70
24	15.55	18.55	15.00	18.95	16.05	......	14.00	13.90	14.10	15.65	15.30	14.55
25	19.65	21.70	16.50	18.40	15.70	......	14.15	13.90	14.90	15.60	15.45	15.00
26	19.85	19.90	18.35	17.70	15.45	......	14.40	13.85	15.00	15.40	15.55	15.00
27	19.45	18.55	17.50	17.40	15.35	......	14.20	14.15	15.00	15.30	15.50	14.80
28	18.50	17.95	17.35	17.10	15.20	......	14.15	14.25	15.00	15.30	15.40	14.50
29	17.85	......	18.20	17.60	15.35	......	14.10	14.80	15.00	15.25	15.35	14.50
30	17.30	......	17.30	17.35	15.40	......	14.05	14.95	15.05	15.15	15.70	14.40
31	16.75	......	16.95	......	15.45	......	13.90	14.75	......	15.50	......	12.90

b For record, June 6 to July 10, inclusive, see Hudson river at Waterford, p. 436.

MOHAWK RIVER AT COHOES, N. Y.

This gaging station, which is located at the Cohoes Water Company's dam, was established April 1, 1904, by E. A. Lamb of this Department in conjunction with the United States Weather Bureau. The gage board is secured to inside of breakwater at north end of forebay about 200 feet above the dam, with its zero mark at elevation 153.47. The gage is graduated in feet and tenths and is read twice daily by William Butler.

The present dam is of masonry, and is built immediately downstream from old wooden dam, which now acts as a timber approach, having a slope of 1 on 2½. The top of the masonry dam slopes away from crest at the rate of 1 on 5, the total width being ten feet. The average elevation of crest is 154.2 aand its length is 1,279 feet; there is an additional spillway in gate-house of 24 feet, making total length of spill, 1,303 feet.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Cohoes, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	154.67	154.87	156.07	156.37	156.37	154.82	154.32	154.47	153.42	154.11	154.12	154.92
2	154.52	154.57	155.87	156.5	157.02	154.77	154.27	153.76	153.33	155.67	154.03	154.87
3	154.57	154.47	155.62	156.72	156.72	154.77	154.37	153.68	153.33	156.27	154.03	154.77
4	154.47	154.47	155.42	156.92	156.67	154.62	154.47	153.35	153.46	155.47	153.98	155.02
5	154.62	154.62	155.52	156.77	156.87	154.72	154.47	153.81	153.45	155.62	153.98	155.17
6	155.07	155.02	155.52	156.92	156.22	154.97	154.12	153.63	153.41	155.72	153.75	154.72
7	155.82	156.57	155.37	157.32	156.17	155.42	154.07	153.78	153.37	155.62	154.92	154.97
8	155.77	156.17	155.32	157.77	156.07	155.22	153.97	154.57	153.83	154.66	154.09	154.32
9	155.52	155.87	155.57	157.07	156.17	154.92	153.97	154.57	153.83	155.22	153.95	154.32
10	155.47	155.52	155.42	156.92	155.92	154.87	154.32	154.57	153.67	155.82	153.86	153.81
11	155.37	155.32	156.27	156.52	156.52	154.92	154.52	154.57	154.42	154.47	154.03	153.83
12	155.27	155.52	156.17	156.02	156.67	155.07	153.76	154.47	154.92	153.89	154.08	1 4.47
13	155.07	155.52	155.87	155.87	156.37	155.32	153.67	154.47	154.62	153.88	153.91	153.72
14	154.82	155.47	155.77	156.97	155.92	155.22	153.55	154.47	153.82	153.85	154.87	153.63
15	154.67	155.37	155.42	158.27	155.87	155.17	153.49	153.59	153.45	154.39	153.95	154.07
16	154.57	155.27	155.32	158.27	156.12	155.07	153.58	153.21	153.42	154.97	15 .81	154.37
17	154.77	155.42	155.22	157.32	156.02	154.97	154.32	153.17	153.23	155.77	153.89	154.57
18	154.57	155.62	155.02	157.07	156.02	155.02	154.37	154.52	153.51	154.41	153.91	154.67
19	154.37	155.72	154.97	156.82	155.67	155.12	153.72	154.72	154.47	154.69	154.92	154.97
20	154.47	157.47	155.02	156.72	155.52	155.32	153.71	154.72	153.68	155.47	155.02	154.09
21	154.72	158.07	155.17	156.87	155.37	155.12	153.67	154.62	153.09	155.37	155.07	153.85
22	154.82	157.17	154.92	156.37	155.27	155.07	153.56	154.67	153.04	154.32	154.67	153.76
23	155.02	156.72	154.87	156.17	155.27	154.97	153.56	154.32	153.09	154.82	154.62	153.76
24	155.22	156.57	155.12	156.07	155.07	154.92	154.22	154.02	153.47	155.27	154.77	153.99
25	156.62	157.77	155.72	156.07	155.07	154.82	154.92	153.93	154.17	155.52	155.17	154.77
26	156.92	157.17	156.87	155.82	155.02	154.82	154.82	15 8	155.72	155.32	154.82	154.87
27	156.52	156.67	156.47	155.67	154.92	154.92	154.62	153.76	154.77	155.22	154.82	154.01
28	156.12	156.52	156.22	155.57	154.97	154.52	154.57	153.83	154.82	154.67	154.99	153.92
29	155.52	......	156.77	155.92	155.02	154.42	154.37	154.42	154.02	154.62	154.72	153.92
30	155.42	......	156.32	155.87	155.27	154.42	154.22	153.42	154.02	154.57	154.77	153.61
31	155.37	......	156.22	......	154.97	......	154.42	152.89	......	154.82	......	153.51

MOHAWK RIVER NEAR DUNSBACH FERRY, N. Y.

This gaging record is kept at the dam of the West Troy Water Company, one-fifth mile above Dunsbach Ferry bridge, 9 miles from the mouth of the river. The dam is in two sections, situated on opposite sides of a Hudson river shale island. The left wing at the upper end of the island has a crest length of 380 feet. The right wing, 500 feet down-stream at the foot of the island, has a crest 280 feet long.

The record was established, March 12, 1898, for the primary purpose of checking a system of levels for the United States Board of Engineers on Deep Waterways, by D. J. Howell, C. E., who has furnished the earlier portion of the record. No record was kept from April 1, 1899, to August 1, 1900. During the period 1900–1907, the record was maintained under the direction of the United States Geological Survey in coöperation with this Department. During 1908 the record was maintained by this Department.

In the pumping station adjoining the dam there are two turbines of the old American type, one 66 inches and the other 75 inches in diameter. A new 54-inch Victor turbine was installed during 1902. The discharge is calculated from the recorded daily run of the water-wheels and working head. The turbines drive pumps, taking water from the river for water-supply purposes, the capacity of the pumps being 3,500,000 gallons per day, equivalent to a continuous flow of 5.4 second-feet.

The dam is of masonry, with a flat granite crest 5.5 feet wide. It was rebuilt in 1903, and a new profile obtained. The crest gage is attached to the timber cribbing 50 feet above the lower section of the dam, with its zero mark at elevation 172.00, referred to the United States Deep Waterways datum. Gage readings are taken twice daily at intervals of about 12 hours, by Robert Wilson. The mean of the two daily readings is used in computing the flow. The discharge over the main dam has been calculated by means of the weir formula, using coëfficients, derived from the United States Geological Survey experiments.

During high water the current of the stream through the cross-section of the channel leading to the lower dam has a velocity of several feet per second. The head due to this velocity has been added to the observed head as a correction for velocity of approach to the lower dam. The upper dam is situated 450 feet up-stream from the crest gage.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Dunsbach Ferry, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	174.63	175.73	176.98	177.38	177.23	175.23	174.53	174.23	173.93	174.43	174.53	174.98
2	174.63	175.78	176.63	177.58	177.98	175.08	174.48	174.13	173.98	174.43	174.48	175.03
3	174.73	175.78	176.48	177.68	177.58	175.03	174.53	174.23	174.03	174.48	174.43	175.03
4	174.68	175.63	176.33	177.88	177.13	174.88	174.58	174.23	174.13	174.53	174.43	175.13
5	174.63	175.58	176.23	178.28	176.63	174.83	174.58	174.28	174.18	174.58	174.48	175.08
6	175.43	175.63	176.08	178.08	176.53	175.08	174.53	174.23	174.28	174.58	174.53	174.98
7	176.47	176.88	175.98	178.33	176.33	175.68	174.48	174.23	174.18	174.43	174.58	174.93
8	176.98	177.28	175.83	178.63	176.03	175.48	174.43	174.28	174.18	174.43	174.63	174.93
9	177.03	176.63	175.93	178.23	175.68	175.18	174.48	174.28	174.33	174.53	174.68	174.88
10	176.63	176.38	176.13	178.13	175.53	175.28	174.53	174.18	174.43	174.48	174.78	174.83
11	176.13	176.23	176.73	177.53	176.28	175.53	174.43	174.13	174.48	174.43	174.83	174.73
12	175.93	175.93	176.68	177.08	178.38	175.68	174.33	174.08	174.63	174.33	174.73	174.63
13	175.68	175.93	176.43	178.88	177.93	175.58	174.33	174.03	174.58	174.33	174.63	174.58
14	175.58	176.03	176.18	177.93	177.28	175.68	174.23	174.03	174.43	174.38	174.63	174.53
15	175.33	175.98	176.08	179.88	176.88	175.78	174.28	173.93	174.43	174.53	174.63	174.63
16	175.23	175.93	176.03	180.08	176.88	175.63	174.38	173.93	174.38	174.53	174.68	174.73
17	175.23	176.03	175.93	179.43	177.13	175.53	174.53	173.93	174.43	174.43	174.98	174.73
18	175.13	176.08	175.73	178.63	176.68	175.43	174.43	174.08	174.33	174.48	175.08	174.73
19	175.28	176.13	175.68	177.88	176.28	175.23	174.38	174.38	174.33	174.53	175.08	174.83
20	175.18	179.03	175.53	177.53	176.03	175.23	174.33	174.98	174.38	174.63	175.03	174.93
21	175.03	180.33	175.43	177.28	175.78	175.23	174.33	174.98	174.48	174.63	175.03	174.83
22	174.93	179.08	175.23	176.98	175.63	175.13	174.33	174.73	174.53	174.68	175.08	174.73
23	175.08	178.28	175.23	176.78	175.53	174.98	174.28	174.63	174.48	174.73	175.13	174.73
24	176.08	177.93	175.33	176.58	175.43	174.93	174.33	174.53	174.43	174.88	175.03	174.63
25	179.03	179.98	175.63	176.53	175.43	174.83	174.58	174.53	174.33	175.13	175.03	174.63
26	178.73	17[illegible].23	177.78	176.38	175.38	174.83	175.08	174.48	174.38	175.13	175.13	174.63
27	177.78	178.08	177.88	176.28	175.23	174.73	174.98	174.33	174.43	175.03	175.08	174.63
28	177.08	177.38	177.93	176.18	175.28	174.68	174.78	174.18	174.53	174.93	175.03	174.73
29	176.53	......	178.18	176.28	175.53	174.63	174.53	174.08	174.63	174.83	174.93	174.63
30	176.08	......	177.83	176.43	175.53	174.63	174.38	173.93	174.58	174.73	174.93	174.53
31	175.83	......	177.63	......	175.38	......	174.23	173.93	......	174.58	......	174.43

Mean Daily Discharge, Second-feet, of Mohawk River at Dunsbach Ferry, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1,871	5,921	12,801	15,371	14,351	3,761	1,641	*951	621	1,411	1,464	2,931
2	1,871	6,171	10,681	16,741	*19,611	3,261	1,521	841	676	1,411	1,344	3,101
3	*2,101	6,171	9,841	17,318	16,741	3,101	1,641	951	731	*1,521	1,234	3,101
4	1,981	5,491	9,001	*18,871	13,731	2,601	*1,761	951	841	1,641	1,234	3,341
5	1,871	5,271	8,441	21,861	10,681	2,431	1,761	1,066	*896	1,732	1,344	*3,261
6	4,621	5,411	7,681	20,351	10,121	*3,261	1,641	951	1,066	1,658	1,464	2,931
7	9,827	*12,171	*7,181	22,251	9,001	5,701	1,521	951	896	1,308	*1,658	2,761
8	12,759	14,691	6,421	24,621	7,431	4,841	1,411	*1,066	896	1,308	1,871	2,761
9	13,090	10,681	6,931	21,461	*5,701	3,591	1,521	1,066	1,180	1,641	1,981	2,601
10	*10,681	9,281	7,941	20,721	5,061	3,981	1,641	852	1,411	*1,521	2,271	2,431
11	7,941	8,441	11,241	*16,401	8,721	5,032	*1,411	738	1,521	1,411	2,431	2,101
12	6,931	6,931	10,912	13,421	22,641	5,598	1,181	683	*1,871	1,181	2,101	*1,871
13	5,701	6,931	9,477	12,171	19,241	*5,271	1,181	687	1,761	1,181	1,871	1,761
14	5,271	*7,431	*8,142	19,241	14,691	5,701	951	731	1,411	1,301	*1,871	1,641
15	4,191	7,181	7,660	35,581	12,171	6,171	1,066	*621	1,411	1,641	1,871	1,871
16	3,701	6,931	7,431	37,481	*12,171	5,491	1,301	621	1,301	1,538	1,981	2,101
17	*3,761	7,402	6,931	31,401	13,711	5,061	1,641	621	1,411	*1,234	2,931	2,101
18	3,431	7,504	5,921	*24,621	10,961	4,621	*1,411	731	1,181	1,344	3,261	2,101
19	3,981	7,764	5,672	18,871	8,721	3,761	1,301	1,301	*1,181	1,464	3,261	*2,431
20	3,591	27,675	5,017	16,401	7,431	*3,761	1,181	2,931	1,301	1,694	3,101	2,761
21	3,101	*39 798	*4,444	14,691	6,171	3,761	1,181	2,931	1,411	1,694	*3,101	2,214
22	2,700	28,321	3,584	12,801	5,491	3,431	1,181	*2,101	1,641	1,808	3,261	2,017
23	3,261	21,861	3,782	11,551	*5,061	2,931	1,066	1,871	1,521	1,921	3,431	2,017
24	*8,191	19,241	4,191	10,401	4,621	2,761	1,181	1,641	1,411	*2,424	3,101	1,787
25	27,901	36,422	5,491	*10,121	4,621	2,431	*1,761	1,641	1,181	3,254	3,101	1,787
26	25,411	29,300	18,131	9,281	4,411	2,431	3,261	1,521	*1,301	3,254	3,431	*1,843
27	18,131	20,286	18,871	8,723	3,761	*2,101	2,931	1,181	1,521	2,924	3,261	1,871
28	13,421	*15,371	*19,241	8,191	3,981	1,981	2,271	896	1,641	2,584	*3,101	2,101
29	10,121	......	21,091	8,721	5,061	1,871	1,641	*786	1,871	2,244	2,761	1,871
30	7,681	......	18,501	8,561	*5,061	1,871	1,301	621	1,761	1,924	2,761	1,641
31	*6,421		17,081	......	4,411	......	951	621	......	*1,584	......	1,411
Mean	7,601	13,790	9,669	17,607	9,534	3,752	1,529	1,133	1,294	1,766	2,395	2,278

* Indicates Sundays.

Monthly Discharge of Mohawk River at Dunsbach Ferry, N. Y.
[Drainage area, 3,440 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	**Minimum.**	**Mean.**	**Per square mile.**	**Depth in inches on drainage area.**
1909.					
January	27,901	1,871	7,601	2.210	2.540
February	39,798	5,271	13,790	4.010	4.170
March	21,091	3,584	9,669	2.810	3.230
April	37,481	8,191	17,607	5.120	5.730
May	22,641	3,761	9,534	2.770	3.190
June	6,171	1,871	3,752	1.090	1.220
July	3,261	951	1,529	0.445	0.512
August	2,931	621	1,133	0.330	0.380
September	1,871	621	1,294	0.376	0.421
October	3,254	1,181	1,766	0.513	0.590
November	3,431	1,234	2,395	0.696	0.780
December	3,431	1,411	2,278	0.662	0.761

MOHAWK RIVER AT REXFORD FLATS, N. Y.

A gage was established August 24, 1905, by this Department, above the State feeder dam at Rexford Flats. A box-and-chain gage is located on the right-hand, or south abutment of the dam, a few feet up-stream from the crest line. The elevation of water-surface, when the gage reads zero, is 208.16; standard chain length 10.75. Readings are taken each morning and afternoon by J. Reepmeyer, Jr., and a record was formerly maintained at this dam to determine the discharge. The results may be found in the report of the State Engineer and Surveyor for 1902, Supplement, pages 186–192. During the navigation season part of the flow of the Mohawk river is diverted to Erie canal through the Rexford Flats feeder.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Rexford Flats, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	*a*	210.01	211.41	211.06	212.16	209.66	209.66	209.46	209.46	209.56	209.86	209.96
2	209.46	209.96	210.96	211.41	212.61	209.66	209.66	209.46	209.46	209.56	409.86	209.96
3	209.56	209.86	210.56	212.01	212.21	209.66	209.76	209.46	209.46	209.56	209.86	209.96
4	209.66	209.81	210.46	212.61	212.16	209.86	209.76	209.46	209.46	209.56	209.81	209.96
5	209.68	209.76	210.41	212.61	212.01	210.01	209.66	209.46	209.46	206.56	209.76	209.96
6	210.61	209.91	210.21	212.58	211.81	210.11	209.66	209.46	209.46	209.56	209.76	209.96
7	211.64	211.66	210.16	213.51	211.61	210.38	209.66	209 46	209.46	209.56	209.66	209.96
8	211.21	211.36	210.16	214.16	211.41	210.11	209.66	209.36	209.46	209.56	209.66	209.91
9	210.68	210.86	210.61	213.46	211.11	209.91	209.56	209.36	209.46	209.56	209.66	209.86
10	210.46	210.71	211.61	212.71	210.76	209.76	209.56	209.31	209.46	209.56	209.66	209.86
11	210.46	210.58	211.41	212.06	212.06	209.96	209.46	209.26	209.56	209.56	209.66	209.86
12	210.51	210.61	211.08	211.41	212.51	210.06	209.41	209.26	209.56	209.56	209.66	209.86
13	209.96	210.76	211.31	210.96	211.61	210.06	209.26	209.26	209.56	209.56	209.66	209.86
14	209.66	210.51	211.36	212.48	211.01	210.26	209.38	209.26	209.56	209.56	209.66	209.86
15	209.66	210.46	211.21	214.91	210.68	210.11	209.56	209.26	209.56	209.56	209.76	209.86
16	209.56	210.31	211.11	214.16	210.66	209.96	209.56	209.26	209.46	209.56	209.91	209.91
17	209.56	210.16	210.91	213.21	211.41	209.91	209.56	209.66	209.46	209.56	210.08	210.01
18	209.56	210.06	210.71	212.76	211.21	209.86	209.61	210.31	209.46	209.56	210.06	210.06
19	209.46	210.51	210.36	212.51	210.91	209.86	209.66	210.36	209.46	209.66	210.06	210.06
20	209.46	214.16	210.16	212.46	210.71	209.81	209.56	210.11	209.46	209.66	210.06	210.06
21	209.46	213.96	210.01	212.34	210.36	209.76	209.56	209.96	209.46	209.66	210.06	210.06
22	209.61	213.01	209.91	211.96	210.01	209.76	209.56	209.86	209.46	209.66	210.08	210.06
23	210.91	212.56	209.86	211.41	209.91	209.66	209.56	209.76	209.46	209.66	210.06	210.06
24	212.61	213.31	209.76	211.11	209.86	209.66	209.81	209.71	209.46	209.96	210.01	210.06
25	212.36	214.31	210.66	211.06	209.76	209.66	209.76	209.66	209.46	210.21	209.96	210.06
26	212.06	213.16	212.81	210.98	209.76	209.66	209.66	209.56	209.46	210.36	209.96	209.96
27	211.66	212.36	211.66	210.96	209.66	209.66	209.56	209.56	209.46	210.21	209.96	209.96
28	211.31	211.91	211.06	210.76	209.76	209.76	209.46	209.46	209.56	210.01	209.96	209.96
29	211.11	......	210.46	210.86	209.91	209.71	209.46	209.46	209.56	209.86	209.96	409.96
30	210.71	......	210.66	211.11	209.76	209.66	209.46	209.46	209.56	209.86	209.96	209.96
31	210.21	......	210.96	......	209.66	......	209.46	209.46	......	209.86	......	209.96

a No record.

MOHAWK RIVER AT SCHENECTADY, N. Y.

A gage was established in the Mohawk river at Scotia bridge, Washington street, Schenectady, April 3, 1904, by this Department. The gage is attached to the down-stream end of first pier from right-hand side of the bridge. A gage zero is at elevation 208.76. Readings are taken by Wm. C. Vrooman. This gaging station is maintained in coöperation with the U. S. Weather Bureau, by this Department.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Schenectady, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	209.86	210.76	212.91	213.71	213.56	209.96	209.26	209.86	209.66	209.76	210.56	210.46
2	209.86	210.76	212.01	213.81	215.01	209.96	209.26	209.76	209.66	209.76	210.71	210.26
3	209.76	210.76	211.76	213.96	214.41	209.61	209.26	209.71	209.66	209.76	210.76	210.26
4	209.76	210.76	211.76	214.16	214.36	209.46	209.26	209.66	209.66	209.76	210.76	210.16
5	211.71	210.56	211.56	214.21	213.71	209.51	209.26	209.76	209.66	209.76	210.46	210.06
6	213.[illegible]6	210.71	211.16	215.11	213.2[illegible]	210.16	209.26	209.71	209.66	209.[illegible]6	210.51	209.96
7	212.56	214.16	211.0	216.36	212.76	211.01	209.31	209.66	209.66	209.86	210.66	209.86
8	211.76	213.71	210.86	218.01	212.76	210.46	209.26	209.66	209.66	209.86	210.66	209.96
9	211.76	213.26	210.56	216.61	212.56	209.91	209.26	209.56	209.66	209.86	210.56	209.96
10	211.46	212.51	210.66	214.91	212.16	209.76	209.16	209.56	209.76	209.76	210.36	209.96
11	210.16	211.61	213.51	213.31	214.26	209.96	209.11	209.56	209.86	209.66	210.16	209.86
12	210.16	211.76	212.16	212.46	214.16	210.66	209.06	209.56	209.96	209.66	209.91	209.86
13	210.16	211.36	211.66	212.36	212.96	210.41	209.06	209.56	209.81	209.66	209.81	209.86
14	210.16	211.46	211.26	214.71	212.06	210.66	209.36	209.56	209.71	209.66	209.76	209.86
15	210.16	211.36	211.11	219.41	211.46	210.56	209.76	209.56	209.66	209.66	209.76	209.86
16	210.16	211.36	211.01	218.56	211.46	210.26	209.76	209.56	209.66	209.66	209.76	209.86
17	210.16	211.56	210.86	215.96	212.71	210.01	209.86	209.76	209.66	209.76	209.76	209.86
18	210.16	211.76	210.61	214.91	212.41	209.96	209.86	210.56	209.66	209.66	209.76	209.86
19	210.16	211.76	210.56	214.36	211.86	210.66	209.86	210.56	209.66	209.66	209.76	209.86
20	210.16	217.31	210.41	214.36	211.31	210.41	209.86	210.51	209.66	209.66	210.36	209.86
21	210.16	217.51	210.46	214.31	210.91	210.21	209.86	210.31	209.66	209.66	210.06	209.86
22	210.16	215.31	210.06	213.26	210.61	209.86	209.86	210.16	209.56	209.66	210.16	209.86
23	210.16	215.01	210.16	213.06	210.46	209.76	209.86	210.01	209.56	209.66	210.16	209.86
24	211.26	216.51	210.46	212.96	210.46	209.66	209.96	209.96	209.76	209.76	210.56	209.86
25	215.51	218.51	212.01	212.76	210.36	209.56	210.56	209.96	209.76	209.76	210.76	209.86
26	215.16	215.31	214.91	211.86	210.16	209.46	210.56	209.81	209.76	209.86	210.56	209.86
27	214.96	214.46	213.36	211.81	209.96	209.46	210.41	209.76	209.76	209.96	210.26	209.86
28	213.76	214.06	213.31	212.11	210.06	209.36	210.21	209.76	209.86	209.96	210.16	209.86
29	212.76	......	214.16	212.36	210.41	209.26	210.06	209.66	209.76	210.06	210.26	209.86
30	212.76	......	213.16	212.26	210.36	209.26	209.96	209.66	209.76	210.26	210.26	209.86
31	212.56	......	213.06	......	210.06	......	209.96	209.66	......	210.36	......	209.86

MOHAWK RIVER AT TRIBES HILL, N. Y.

This gaging station, which is located at the suspension bridge over the Mohawk river between Fort Hunter and Tribes Hill, was established April 3, 1904, by E. A. Lamb of this Department in coöperation with the U. S. Weather Bureau. The gage is a vertical board attached to the down-stream end of the north abutment of the suspension bridge. It is graduated in feet and tenths and the elevation of zero was 267.71 till May 26, 1909, after which the zero was changed to 267.75.

The elevation of bench-mark, marked "U. S. Weather Bureau Tablet No. 13," set in second course of the northeast anchorage of this bridge, is 295.021. Observations of the stage of the stream were taken twice each day.

Current-meter measurements are taken from the down-stream side of the suspension bridge, which is 535.6 feet long between abutments. The channel of the river is straight for some distance each way from the bridge, and the cross-section directly under the bridge and below the bridge is quite uniform. About 300 feet above the bridge rapids are formed during low water, the river being shallow and having a rough and stony bed.

This gaging station is located about 1,000 feet below the junction of the Mohawk river and Schoharie creek, and the record here will show the combined discharge of these streams.

Beginning in 1907 the conditions at this station have been modified by construction work for the Barge canal, in progress near-by.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Tribes Hill, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	267.91	269.46	270.81	271.46	272.11	268.75	267.95	267.55	267.35	267.55	268.00	268.75
2	268.56	269.31	270.31	271.56	273.11	268.65	267.85	267.55	267.35	267.55	267.95	268.65
3	268.26	269.06	270.16	271.81	272.16	268.55	267.85	267.55	267.35	267.60	267.95	268.60
4	268.11	269.06	269.96	272.26	272.11	268.40	267.95	267.45	267.35	267.75	267.95	268.40
5	268.21	268.96	269.81	272.21	271.61	268.35	267.95	267.45	267.35	267.75	268.05	268.25
6	271.31	271.21	269.31	272.26	271.36	269.50	267.95	267.45	267.35	267.60	267.95	268.25
7	271.66	271.61	269.06	272.31	271.61	269.85	267.85	267.35	267.55	267.50	267.85	268.30
8	271.06	271.26	268.91	274.36	271.36	269.30	267.75	267.25	267.75	267.45	267.85	268.30
9	270.81	271.36	269.01	273.81	270.91	268.85	267.75	267.25	267.75	267.45	267.85	268.45
10	270.21	270.96	269.96	272.96	270.61	268.55	267.55	267.25	267.65	267.45	267.95	268.55
11	269.76	270.56	271.16	271.86	272.46	268.95	267.45	267.25	267.65	267.45	268.05	268.10
12	269.71	269.86	270.81	271.06	271.96	269.65	267.35	267.25	267.65	267.45	268.05	267.95
13	269.66	269.66	270.61	270.61	271.26	269.40	267.25	267.25	267.65	267.45	268.05	267.95
14	269.61	269.00	269.91	272.51	270.46	269.60	267.25	267.25	267.55	257.45	268.05	268.10
15	269.51	269.86	269.51	275.61	269.96	269.40	267.25	267.25	267.45	267.45	268.05	268.30
16	269.51	270.06	269.36	274.91	269.91	269.05	267.25	267.25	267.45	267.45	268.05	268.45
17	269.36	270.51	269.31	273.21	270.86	268.80	267.95	267.50	267.45	267.45	268.05	268.55
18	269.26	270.46	268.96	272.46	270.61	269.15	267.55	268.55	267.45	267.45	268.15	268.65
19	269.21	270.01	268.76	272.36	270.11	269.65	267.55	268.75	267.45	268.15	268.15	268.60
20	269.06	275.91	268.91	272.16	269.81	269.25	267.55	268.40	267.45	268.25	268.40	268.65
21	269.01	275.46	268.86	272.26	269.46	268.95	267.55	268.25	267.45	268.05	268.55	268.70
22	268.96	272.51	268.96	271.56	269.31	268.70	267.55	268.15	267.45	268.05	268.55	268.70
23	268.91	272.06	269.11	271.26	269.26	268.50	267.5	267.95	267.45	268.55	268.65	268.65
24	270.21	273.08	269.21	271.16	269.16	268.45	268.80	268.65	267.45	269.10	269.25	268.75
25	273.26	274.01	269.41	270.71	269.01	268.35	269.00	267.45	267.55	268.90	269.25	268.95
26	272.11	272.46	273.26	270.46	269.00	268.25	268.85	267.35	267.55	268.70	269.10	269.05
27	271.81	271.81	271.26	270.31	268.80	268.15	268.55	267.35	267.55	268.45	268.75	269.15
28	271.36	271.51	271.46	270.76	269.10	268.05	268.35	267.35	267.55	268.20	268.65	269.15
29	270.61	......	271.36	270.76	269.30	268.00	268.15	267.35	267.55	268.05	268.80	268.95
30	270.16	......	271.26	270.96	269.20	268.05	267.85	267.35	267.55	268.05	268.95	268.85
31	269.91	......	271.41	......	268.95	......	267.75	267.35	......	267.95	......	268.75

SCHOHARIE CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The source of Schoharie creek is about two miles east of Tannersville, at an elevation of 1,940 feet. The source is within about four miles of the easterly escarpment of the Catskill plateau. The stream valley is broad and the slope moderate throughout the upper regions. A small area, which apparently was formerly tributary to Schoharie creek, has been cut off by erosion and has thus become tributary to Kaaterskill. Nearly the entire drainage basin is irregular and precipitous. It is extensively covered with second-growth forests.

The basin of Schoharie creek is largely overlain by slaty rocks, into which water percolates only to a slight depth. The valley soil is largely thin plastic clay, formed by disintegration of the native rocks. Passing from the head waters toward the mouth, Schoharie creek crosses successively the Devonian sedimentary rocks, chiefly of the Catskill, Oneonta, Ithaca and Hamilton formations. All of these may be considered fairly impervious and free from fissures. It then crosses belts of Silurian formations, including Helderberg, Saline, Niagara and Medina sandstone and limestone. These rocks are underlaid by impervious Hudson river shales, but are themselves permeable, yielding numerous springs at the lower partings.

The entire drainage basin is shown on the topographic maps of the U. S. Geological Survey, the elevation and area at different points along the stream being as follows:

*Drainage Areas of Schoharie Creek.**

LOCATION.	DISTANCE IN MILES.†			Elevation.	FALL IN FEET.		DRAINAGE AREA IN SQUARE MILES.	
	From mouth.	From Prattsville.	Place to place.		Place to place.	Per mile.	Point to point.‡	Total.
Reservoir site........	64.0	0	....	1,240	......	......	228	228
Prattsville gage.....	62.5	1.5	1.5	1,160	80	53.3	10.4	238.4
Devasego Falls......	60.5	3.5	2.0	1,100	60	30.0	8.1	246.5
Gilboa............	55.5	8.5	5.0	1,000	100	20.0	58.5	305
NorthBlenheim.....	48.5	15.5	7.0	800	200	22.3	92.9	397.9
Breakabeen.........	43.0	21	5.5	710	90	16.4	23.8	421.7
Middleburg.........	35.0	29	8.	620	90	11.2	105.7	527.4
Schoharie..........	29.5	34.5	5.5	590	30	5.5	26.6	554
Mouth of Fox creek..	28.0	36.0	1.5	585	5	3.3	90.5	644.5
Above Cobleskill cr'k	24.0	40.0	4.0	580	5	1.2	12.8	657.3
Mouth of Cobleskill.	24.0	40.0	0	580	0	......	135.9	793.2
Esperance..........	18.0	46.0	6.0	560	20	3.3	63.2	856.4
Burtonsville.........	14.5	49.5	3.5	520	40	11.4	14	870.4
Mill Point branch...	6.0	58.0	8.5	340	180	21.1	30.3	900.7
Mouth (Ft. Hunter).	0	64.0	6.0	280	60	7.5	8.6	909.3

* From U. S. Geological Survey topographic maps.

† Measured along general course of stream.

‡ From head.

The results of gagings of this stream at stations formerly maintained may be found in the report of the State Engineer and Surveyor for 1902. Supplement pages 169–180.

SCHOHARIE CREEK AT FORT HUNTER, N. Y.

A gage was erected on Schoharie creek above the State feeder dam at Fort Hunter, November 17, 1904, by C. A. Poole, of this Department. The gage is maintained in coöperation with the U. S. Weather Bureau. The gage is attached to the down-stream wing wall of the right-hand abutment of the West Shore R. R. bridge. It is vertical and divided to feet and tenths and is in two sections, the lower section reading from zero to 3.9, the upper section reading from 3.9 to 16 feet. The zero mark is at elevation 280.5. Readings are taken at 8 A. M. and 6 P. M. each day.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Schoharie Creek at Fort Hunter, N. Y.

DAY.	Jan.	Feb.*a*	Mar.*a*	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	281.50	......	......	*a*	282.80	281.80	280.40	279.35	279.05	278.95	280.00	281.15
2	281.60	......	......	*a*	282.45	281.75	280.45	279.40	278.90	278.95	279.15	281.20
3	281.50	......	......	*a*	282.95	281.70	280.25	279.15	278.94	279.00	279.30	281.25
4	281.50	......	......	*a*	283.35	281.70	280.20	280.05	278.72	278.90	280.20	281.25
5	282.15	......	......	*a*	283.00	281.[illegible]0	280.10	278.95	278.90	278.95	279.15	281.15
6	284.95	......	......	*a*	282.85	281.80	280.05	279.25	278.85	279.00	279.15	281.25
7	283.65	......	......	*a*	283.15	281.80	280.00	279.35	278.90	278.85	*a*	281.05
8	282.60	......	......	*a*	282.80	281.70	279.10	278.80	278.95	278.90	279.60	281.15
9	282.35	......	......	*a*	282.55	281.65	279.15	278.95	278.95	278.80	279.65	281.25
10	282.10	......	......	*a*	282.70	281.70	278.70	279.00	278.90	278.85	279.75	281.15
11	282.30	......	......	*a*	283.80	281.85	278.65	278.80	278.95	279.00	279.75	281.10
12	282.30	......	......	*a*	283.00	282.05	279.15	278.85	279.00	279.30	281.00	281.20
13	282.30	......	......	*a*	282.55	281.90	279.20	279.05	278.95	279.15	279.60	281.15
14	282.30	......	......	*a*	282.40	282.10	279.35	278.95	278.85	279.15	279.85	281.35
15	282.30	......	......	*a*	282.30	282.05	279.00	278.90	278.80	278.95	280.30	281.25
16	282.30	......	......	*a*	282.45	281.95	279.05	279.05	278.75	279.00	281.70	281.15
17	282.30	......	......	*a*	282.70	281.85	279.25	279.05	278.75	279.10	279.70	281.45
18	282.30	......	......	*a*	282.60	282.10	279.80	278.90	278.85	278.90	279.50	281.55
19	282.30	......	......	*a*	282.45	282.35	279.60	278.85	278.95	279.15	279.80	281.35
20	282.30	......	......	*a*	282.35	282.15	279.60	279.15	278.90	279.70	280.55	281.20
21	282.30	......	......	*a*	282.30	281.90	280.05	280.80	278.95	278.95	281.20	281.25
22	282.30	......	......	*a*	282.30	281.85	279.70	280.30	278.90	279.05	281.10	281.25
23	282.30	......	......	*a*	282.20	282.05	279.90	279.75	278.90	279.05	281.10	281.55
24	284.60	......	......	*a*	282.20	282.20	279.65	279.70	278.95	279.00	281.10	281.45
25	284.30	......	......	282.30	282.20	281.80	279.85	279.60	278.95	279.25	281.25	281.35
26	283.90	......	......	282.30	282.05	281.55	280.25	279.25	278.90	280.10	281.20	281.45
27	283.40	......	......	282.25	281.85	281.40	280.30	279.10	278.85	279.30	281.25	281.40
23	283.05	......	......	282.35	281.85	281.30	280.00	279.20	278.95	278.85	281.15	281.40
29	282.75	......	......	282.30	281.80	280.80	280.25	279.20	278.95	278.95	281.25	281.20
30	282.45	......	......	282.35	281.85	280.95	279.45	279.20	278.90	279.00	281.20	281.30
31	*a*	......	......	......	281.85	......	279.70	279.10	......	279.00	......	281.35

a No record.

SCHOHARIE CREEK AT CENTRAL BRIDGE, N. Y.

A gaging station, established April 3, 1904, at Central Bridge is maintained by this Department in coöperation with the U. S. Weather Bureau. Preceding July 30 the readings during 1907 were taken by measuring down to water-surface with a steel tape from a reference point on the D. & H. R. R. bridge. Beginning July 30, 1907, a box-and-chain gage has been used. The gage is attached to the ties of the up-stream track near the right-hand end of the bridge. The standard chain length 33.00 feet. The scale is graduated to feet and tenths from zero to 14 feet. Readings are taken at 6 A. M. and 6 P. M. each day by A. M. Spencer. The gage is located a short distance below the junction of Cobleskill with Schoharie creek. Elevation of water-surface, when gage reads zero, is 565.96.

Mean Daily Elevation of Water-surface(a) of Schoharie Creek at Central Bridge, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	566.80	570.25	568.90	569.40	570.55	568.02	567.28	566.65	566.65	567.22	566.70	567.02
2	566.80	570.10	569.05	569.45	570.68	567.98	567.12	566.65	566.60	567.22	566.70	567.00
3	566.70	570.05	568.75	569.40	569.85	567.85	567.25	566.62	566.60	566.12	566.70	566.90
4	566.85	570.20	568.55	569.50	572.05	567.55	567.22	566.62	566.60	567.00	566.70	566.85
5	568.40	570.20	568.37	569.55	570.88	567.95	567.18	566.60	566.55	566.88	566.70	566.80
6	572.40	572.10	568.25	569.85	571.15	568.02	567.05	566.60	566.55	566.85	566.70	566.70
7	570.05	570.20	568.42	571.00	570.28	567.90	567.02	566.58	566.55	566.80	566.70	566.82
8	571.95	569.20	568.35	570.75	569.92	567.72	567.00	566.58	566.55	566.80	566.65	566.92
9	571.70	568.55	568.30	569.75	569.68	567.68	566.95	566.55	566.55	566.78	566.65	566.85
10	571.35	568.22	570.80	569.45	569.55	567.75	566.90	566.52	566.55	566.75	566.65	566.72
11	571.30	568.50	571.25	569.15	572.35	569.00	566.82	566.50	566.60	566.75	566.62	566.65
12	571.02	568.75	569.50	568.95	570.52	568.50	566.78	566.50	566.58	566.75	566.60	566.62
13	570.40	568.75	569.20	568.85	569.95	568.20	566.72	566.48	566.55	566.75	566.60	566.68
14	570.40	568.80	568.95	569.50	569.50	568.30	566.72	566.45	566.55	656.78	566.60	566.82
15	570.38	569.30	568.85	574.15	569.45	568.25	566.72	566.45	566.60	566.78	566.60	566.82
16	570.30	570.05	568.70	572.25	569.40	568.25	566.72	566.45	566.70	566.78	566.60	568.21
17	570.28	571.25	568.60	570.80	570.15	568.50	566.98	566.52	566.68	566.72	566.60	568.44
18	570.20	569.45	568.45	570.05	569.90	569.30	566.88	566.68	566.62	566.70	566.55	568.28
19	570.20	569.25	568.35	569.85	569.50	569.08	566.92	566.85	566.58	566.70	566.55	568.24
20	570.35	584.80	568.35	569.75	569.18	568.15	566.80	567.18	566.55	566.70	566.55	568.26
21	570.40	571.65	568.25	569.55	568.95	568.25	566.80	567.08	566.55	566.70	566.55	568.28
22	570.85	570.60	568.12	569.50	568.80	568.12	566.75	567.00	566.52	566.70	566.55	568.28
23	572.55	570.40	568.02	569.38	568.80	568.08	566.75	566.95	566.50	566.70	566.55	568.21
24	575.25	572.52	568.15	569.25	568.75	567.95	567.12	566.88	566.60	566.72	566.55	568.16
25	573.30	573.85	569.20	569.15	568.55	567.78	567.08	566.08	566.58	566.80	566.55	568.21
26	570.65	570.20	572.88	569.02	568.35	567.65	566.98	566.78	566.55	566.75	566.60	568.31
27	569.70	570.10	571.50	569.02	568.15	567.60	566.92	566.72	566.65	566.75	566.62	568.51
28	569.20	569.65	571.15	568.75	568.45	567.82	566.82	566.70	566.72	566.72	566.72	568.44
29	568.70	......	571.00	568.68	568.42	567.50	566.78	566.70	567.30	566.72	566.82	568.36
30	568.58	......	569.70	568.85	568.25	567.42	565.72	566.70	567.25	566.72	566.92	568.36
31	568.52	......	569.45	......	568.08	......	566.85	566.65	......	566.72	......	568.36

a Arbitrary datum.

SCHOHARIE CREEK AT MIDDLEBURG, N. Y.

A temporary gaging station was established at Middleburg August 24, 1906, by Robert E. Horton for this Department. The gage consists of an enameled steel scale subdivided to hundredths of a foot, which is attached vertically to a pile forming part of the shore protection on the right-hand bank of the stream, about 300 feet below Middleburg bridge. The zero mark of the gage is 27.6 feet below the top of the iron rod at the upper end of the pile. The stream channel is straight for a considerable distance below and above the gage. The bed is of gravel and cobblestones fairly smooth and permanent. The stream is confined near the right bank during low water and measurements are made by boat or by wading opposite the gage. At ordinary high stages the stream can be measured from the Middleburg bridge. Gage readings are taken each morning and night by Minnie E. Wheeler.

Discharge at this station for 1909 is not at present available.

Mean Daily Gage Height, in Feet, of Schoharie Creek at Middleburg, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1.80	3.58	3.30	3.18	4.15	2.20	1.62	1.08	0.95	1.32	1.05	1.15
2	2.05	3.80	3.10	3.15	4.60	2.12	1.62	1.65	0.98	1.18	1.05	1.20
3	1.95	3.68	3.00	3.30	4.02	2.05	1.62	1.00	0.95	1.18	1.05	1.20
4	1.75	3.45	2.85	3.60	5.30	2.02	1.58	1.00	0.95	1.08	1.05	1.15
5	2.57	3.62	2.50	3.25	4.35	2.25	1.48	1.00	1.00	1.10	1.05	1.25
6	5.85	9.40	2.62	3.32	4.80	2.25	1.42	1.00	1.05	1.10	1.05	1.15
7	3.98	3.60	2.60	4.18	4.18	2.15	1.40	1.00	0.95	1.10	1.05	1.12
8	3.10	3.10	2.55	4.28	4.02	2.00	1.40	1.00	0.90	1.10	1.05	1.22
9	2.90	2.62	2.40	3.72	3.68	1.90	1.32	1.00	0.90	1.05	1.00	1.[illegible]8
10	2.78	2.75	5.00	3.42	3.50	2.00	1.28	1.00	0.90	1.05	1.05	1.30
11	2.75	3.75	4.50	3.05	5.25	3.08	1.25	0.95	0.95	1.05	1.05	1.10
12	2.65	2.80	3.48	2.98	4.28	2.65	1.20	0.95	0.95	1.00	1.05	1.10
13	2.82	2.90	3.35	2.88	3.80	2.40	1.20	0.95	0.95	1.00	1.05	1.05
14	3.28	3.10	3.10	7.53	3.55	2.48	1.20	0.90	0.95	1.00	1.05	1.22
15	3.[illegible]5	3.22	2.72	7.25	3.52	2.52	1.20	0.90	0.95	1.00	1.05	2.15
16	3.58	3.60	2.75	5.25	3.92	2.4[illegible]	1.35	0.90	0.98	1.00	1.05	2.12
17	3.20	4.50	2.75	4.45	4.02	2.28	1.42	0.98	1.00	1.05	1.05	1.88
18	3.32	3.35	2.65	4.02	3.75	3.80	1.30	1.08	1.00	1.10	1.05	1.68
19	3.12	3.20	2.45	3.75	3.50	3.10	1.25	1.70	0.95	1.08	1.05	1.68
20	3.05	10.70	2.55	3.75	3.20	2.75	1.20	1.55	0.95	1.05	1.05	1.72
21	3.05	5.15	2.30	3.45	3.00	2.55	1.20	1.42	0.95	1.05	1.00	1.52
22	2.90	4.35	2.30	3.42	2.95	2.35	1.15	1.32	0.95	1.00	1.00	1.35
23	4.18	3.90	2.20	3.30	3.00	2.40	1.25	1.2[illegible]	0.95	1.00	1.00	1.42
24	6.05	5.62	2.25	3.32	2.88	2.32	1.52	1.22	0.95	1.08	1.00	1.45
25	5.32	5.75	2.85	3.00	2.70	2.15	1.38	1.15	0.95	1.10	1.10	1.30
26	4.15	3.75	4.72	3.25	2.55	2.05	1.28	1.18	0.95	1.10	1.10	1.38
27	3.50	3.85	3.45	3.02	2.45	1.95	1.20	1.15	0.95	1.10	1.05	1.65
28	3.18	3.70	4.08	3.10	2.75	1.88	1.20	1.10	1.08	1.18	1.05	1.60
29	2.80	......	3.98	2.98	2.70	1.88	1.20	1.05	1.25	1.10	1.15	1.48
30	3.02	......	3.42	3.30	2.52	1.75	1.15	1.05	1.42	1.05	1.25	1.55
31	4.42	......	3.25	....	2.30	......	1.10	0.98	......	1.05	......	1.55

Mean Daily Discharge, Second-feet, of Schoharie Creek at Middleburg, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	215	1,490	1,216	1,101	2,200	390	156	39	26	79	36	49
2	322	1,750	1,032	1,078	2,800	356	156	36	29	52	36	56
3	164	1,610	940	1,216	2,025	322	156	31	26	52	36	56
4	196	1,354	810	1,520	4,020	311	141	31	26	39	36	49
5	614	1,550	565	1,170	2,460	418	114	31	31	42	36	65
6	5,100	16,000	648	1,239	3,150	418	101	31	36	42	36	49
7	1,970	1,520	630	2,225	2,225	368	95	31	26	42	36	45
8	1,032	1,032	598	2,360	2,025	300	95	31	22	42	36	60
9	850	648	500	1,670	1,610	250	79	31	22	36	31	70
10	757	735	3,500	1,331	1,400	300	70	31	22	36	36	74
11	735	1,700	2,700	985	3,950	1,009	65	26	26	36	36	4
12	665	780	1,377	920	2,300	665	56	26	26	31	36	42
13	795	850	1,262	830	1,750	500	56	26	26	31	36	36
14	1,193	1,032	1,032	9,470	1,460	549	56	22	26	31	36	60
15	1,400	1,147	718	8,700	1,430	581	56	22	26	31	36	36
16	1,490	1,520	735	3,950	1,915	516	84	22	29	31	36	356
17	1,124	2,700	735	2,600	2,025	431	101	29	31	36	36	240
18	1,239	1,262	598	2,025	1,700	1,750	74	39	31	42	36	17
19	1,055	1,124	532	1,700	1,400	1,032	65	180	26	39	36	172
20	986	21,500	598	1,700	1,124	757	56	134	26	36	36	188
21	986	3,750	445	1,354	940	598	56	101	26	36	31	127
22	850	2,460	445	1,331	890	472	49	79	26	31	31	84
23	2,225	1,890	390	1,216	940	500	65	70	26	31	31	101
24	5,520	4,650	418	1,239	830	459	127	60	26	39	31	10
25	4,060	4,900	810	940	700	368	90	49	26	42	42	74
26	2,200	1,700	3,025	1,170	598	322	70	52	26	42	42	90
27	1,400	1,800	1,354	963	532	270	56	49	26	42	36	164
28	1,101	1,640	2,085	1,032	735	240	56	42	39	52	36	148
29	780	......	1,970	920	700	240	56	36	65	42	49	114
30	963	......	1,331	1,216	581	196	49	36	101	36	65	134
31	2,560	......	1,170	......	445	......	42	29	......	36	......	134
Mean	1,439	3,003	1,102	1,972	1,642	496	82	47	31	40	37	114

Monthly Discharge of Schoharie Creek at Middleburgh, N. Y.
[Drainage area, 527 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean	Per square mile.	Depth in inches on drainage area.
1909.					
January	5,520	164	1,439	2.73	3.14
February	21,500	648	3,003	5.70	5.9
March	3,500	390	1,102	2.09	2.40
April	9,470	830	1,972	3.74	4.19
May	4,020	445	1,642	3.12	3.59
June	1,750	196	496	0.941	1.05
July	156	42	82	0.156	0.179
August	180	22	47	0.089	0.102
September	101	22	31	0.059	0.066
October	79	31	40	0.076	0.087
November	65	31	37	0.070	0.078
December	368	36	114	0.216	0.248

SCHOHARIE CREEK AT PRATTSVILLE, N. Y.

Schoharie creek above Prattsville drains a rugged, mountainous area, almost entirely wooded. The watershed, 238 square miles in extent, lies wholly within Greene county. Rocks of the Catskill formation, chiefly sandstones and conglomerates, lie at or near the surface over most of the area. The basin is surrounded by nearly continuous mountain ranges, and intervening ridges divide the main stream from its principal tributaries — Batavia kill, East kill and West kill.

The gaging station was established November 7, 1902, by Robert E. Horton for the U. S. Geological Survey in coöperation with the New York Water Supply Department, on the highway bridge. It was assumed and continued by the Board of Water Supply of the city of New York on May 7, 1907, at which time a new standard board of water supply chain gage was installed. The old datum was preserved and the present readings conform to those already obtained.

The gage is attached to the floor of the bridge on the up-stream side near the left bank. The chain length is 27.05 feet. The elevation of the datum of the gage is 1,130.03 (U. S. G. S. B. M.). The gage datum is referred to a bench-mark — a circle of white paint marked on a boulder at the right end of the down-stream side of the bridge, elevation 1,151.00, or 20.97 above the datum of the gage.

Gage readings are made each morning and evening by Miss Enda M. Snyder of Prattsville, N. Y.

The bridge is a single span steel highway bridge, 187.8 feet between abutments, and all the water passes between them at all but the very highest stages.

In high water measurements are made from the bridge, while in low water stages they may be made by wading at a point about 500 feet below the bridge.

The data for 1909 is not at present available.

MOHAWK RIVER AT FULTONVILLE BRIDGE, FONDA, N. Y.

This gaging station was established April 29, 1906, by R. H. Merrill, for this Department. A box-and-chain, reading decimally from zero to 12 feet, is located on the down-stream guard-rail of the middle span of the bridge. The stream channel is straight and the river uniform for about one-half mile above and below the bridge. The river becomes ice covered in winter, but the conditions are generally good for current-meter measurements. The bridge comprises three spans and is subdivided to five-foot intervals on the down-stream side, the initial point being at the face of the left-hand abutment.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Fultonville Bridge, Fonda, N. Y.

DAY.	Jan	Feb.	Mar.	April	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	......	a	281.05	279.17	279.10	274.73	274.10	273.83	273.61	274.04	274.07	276.50
2	......	a	280.05	279.32	280.50	274.48	274.05	273.68	273.46	274.14	274.02	274.95
3	......	a	279.25	279.97	279.80	274.43	274.00	273.68	273.36	274.04	274.02	274.65
4	......	a	279.00	279.82	279.85	274.43	274.00	273.68	273.36	273.99	274.02	274.55
5	......	a	278.25	279.92	278.80	274.63	274.00	273.68	273.56	273.94	274.02	274.65
6	......	a	277.85	281.17	278.00	276.03	273.90	273.68	273.56	273.94	274.02	274.55
7	......	a	277.70	283.07	278.40	276.73	273.90	273.58	273.76	273.89	274.02	274.60
8	......	a	277.55	284.07	278.35	275.63	273.90	273.53	273.86	273.79	274.02	274.90
9	......	a	277.40	282.87	278.00	275.13	273.75	273.43	273.86	273.69	274.12	274.85
10	......	a	277.05	282.02	277.65	274.93	273.70	273.38	273.91	273.64	274.07	274.75
11	......	a	278.80	278.87	278.50	275.83	273.70	273.28	274.06	273.69	274.02	274.36
12	......	a	279.10	277.92	279.85	275.93	273.70	273.28	274.11	273.64	274.02	274.35
13	......	a	278.90	278.47	277.95	275.58	273.65	273.33	273.81	273.59	274.02	274.40
14	......	a	277.85	281.82	277.25	275.98	273.60	273.38	273.51	273.74	274.02	274.55
15	......	a	277.50	285.07	276.80	275.73	273.65	273.28	273.26	273.69	274.06	274.60
16	......	a	277.35	284.07	277.40	275.23	273.70	273.43	273.16	273.64	274.05	274.85
17	......	a	277.30	282.07	277.65	274.73	273.85	274.48	273.26	273.69	274.05	274.80
18	......	a	276.90	281.17	277.40	275.43	273.80	275.03	273.51	273.99	274.20	274.60
19	......	a	276.55	280.57	276.80	275.78	273.85	274.78	273.46	274.14	274.25	274.55
20	......	a	276.35	280.77	276.45	275.78	273.75	274.73	273.41	274.29	274.45	274.50
21	......	a	276.20	280.37	276.00	275.18	273.80	274.68	273.36	274.24	274.55	274.50
22	......	a	276.20	279.47	275.55	274.78	273.80	274.48	273.41	274.34	274.60	274.40
23	......	a	276.35	279.17	275.40	274.63	273.90	274.08	273.46	274.44	274.80	274.40
24	......	284.00	276.95	278.57	275.30	274.48	274.75	273.68	273.51	275.34	276.00	274.40
25	......	286.05	279.05	278.32	275.10	274.38	275.25	273.68	273.66	275.49	276.00	274.45
26	......	284.75	282.10	277.72	274.95	214.28	275.15	273.58	273.71	275.54	275.00	274.55
27	......	283.65	281.30	277.37	274.85	274.23	274.80	273.63	273.76	274.54	276.55	274.60
28	......	282.60	282.70	278.42	275.05	274.18	274.45	273.68	273.76	274.24	276.85	274.70
29	......	......	281.20	278.12	275.35	274.13	274.20	273.63	273.86	274.09	276.90	275.25
30	......	......	280.40	278.27	275.15	274.13	273.95	273.48	274.01	274.19	277.00	275.50
31	......	......	278.30	......	275.00	......	273.90	273.23	......	274.24	......	275.50

a No record.

MOHAWK RIVER AT CANAJOHARIE, N. Y.

A gaging station was established by this Department at the highway bridge crossing Mohawk river at Canajoharie, September 16, 1908. The gage is of the weight-and-chain variety contained in a box of standard form fastened to the hand railing of the upstream side of the bridge. The gage reads from zero to 11 feet by feet and tenths. Length of gage-chain from end of weight to marker is 42.35 feet. The datum of the gage is 282.45. The drainage area at this gaging station is given as 1,862 square miles in the Barge canal report of 1901. Gage readings are taken each morning and night. The observers were M. J. Powers, from September 16, 1908, to January 31, 1909, and H. M. Hoag, beginning February 1, 1909.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Canajoharie, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	286.20	290.15	292.95	290.35	291.15	286.05	284.80	284.35	283.80	284.14	285.15	286.55
2	286.45	289.80	292.30	290.75	292.35	285.85	284.70	284.20	283.90	284.04	285.10	286.15
3	286.50	289.70	291.70	291.50	291.50	285.50	285.00	284.20	283.90	284.84	285.10	286.10
4	286.45	289.05	291.20	292.10	291.35	285.50	284.75	284.10	283.90	284.89	285.15	286.00
5	286.70	287.95	290.40	291.90	290.30	286.05	285.10	284.00	284.10	284.79	285.10	285.95
6	290.60	293.35	289.60	292.95	289.50	288.20	284.95	284.05	284.35	284.89	285.10	285.70
7	292.10	293.80	289.70	295.30	289.90	287.85	284.80	283.95	284.90	284.69	285.05	285.80
8	291.45	293.30	289.30	296.25	290.00	286.75	284.65	283.70	284.65	284.39	284.95	285.70
9	290.85	293.30	289.05	295.10	290.20	286.25	284.05	283.80	284.55	284.19	285.35	285.45
10	290.35	291.90	289.00	292.55	289.25	286.10	284.30	283.75	284.25	284.24	285.50	285.35
11	289.35	290.75	291.30	290.50	291.40	286.00	284.25	283.65	285.15	284.14	285.40	285.70
12	289.00	290.75	291.75	289.60	291.40	286.20	284.35	283.80	284.75	284.04	285.30	285.85
13	288.45	290.50	291.35	290.20	289.45	286.65	284.45	283.70	284.30	284.54	285.20	286.00
14	288.10	290.50	291.25	295.10	288.80	286.20	284.30	283.55	284.10	284.39	284.95	286.25
15	287.75	290.05	290.80	296.90	288.45	286.70	284.15	283.50	284.15	284.39	284.95	286.40
16	289.65	290.85	289.65	295.80	288.80	286.35	284.70	283.60	284.10	284.34	284.85	286.35
17	289.50	290.85	289.40	293.75	288.90	286.15	284.60	286.60	284.25	284.29	284.35	286.20
18	288.90	290.75	288.70	292.95	288.70	286.95	284.35	286.50	284.05	285.04	286.30	286.05
19	288.85	290.40	288.40	292.20	288.05	287.15	284.40	286.15	283.85	285.84	286.60	285.90
20	288.55	296.35	288.25	293.10	287.50	286.75	284.60	285.50	283.80	285.59	286.15	285.85
21	288.15	296.05	287.90	292.15	287.15	286.35	284.65	285.40	283.65	285.34	286.00	285.85
22	288.05	295.55	287.95	291.05	286.80	286.00	284.50	284.80	283.80	285.74	286.05	285.85
23	288.20	295.15	288.00	290.75	286.80	285.75	284.65	284.65	283.95	286.54	286.80	285.75
24	291.20	294.50	288.80	289.75	286.65	285.55	286.65	284.50	284.45	286.89	287.30	285.70
25	294.15	296.90	292.10	289.20	286.40	285.50	286.75	284.45	284.65	286.59	287.05	285.75
26	294.40	296.85	293.75	289.25	286.20	285.30	286.50	284.30	284.40	286.15	286.55	285.65
27	293.45	295.75	286.00	289.80	286.00	285.25	285.95	284.10	284.25	286.05	286.35	285.75
28	292.10	294.70	292.35	289.80	286.40	285.25	285.40	283.95	284.25	285.50	286.15	285.75
29	291.25	......	291.05	289.65	286.80	285.25	285.00	283.85	284.55	285.45	286.40	285.65
30	290.05	......	289.55	290.00	286.55	285.00	284.70	283.85	284.30	285.20	286.90	285.65
31	289.55	......	289.65	......	286.30	......	284.55	283.75	......	285.25	......	285.75

MOHAWK RIVER AT FORT PLAIN, N. Y.

A gage was established on the highway bridge crossing the Mohawk river at Fort Plain, December 30, 1905, by C. A. Poole, for this Department. A box-and-chain gage is attached to the

the middle span of the bridge. The stream channel is straight and the river uniform for about one-half mile above and below the bridge. The river becomes ice covered in winter, but the conditions are generally good for current-meter measurements. The bridge comprises three spans and is subdivided to five-foot intervals on the down-stream side, the initial point being at the face of the left-hand abutment.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Fultonville Bridge, Fonda, N. Y.

DAY.	Jan	Feb.	Mar.	April.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	......	*a*	281.05	279.17	279.10	274.73	274.10	273.83	273.61	274.04	274.07	276.50
2	......	*a*	280.05	279.32	280.50	274.48	274.05	273.68	273.46	274.14	274.02	274.95
3	......	*a*	279.25	279.97	279.80	274.43	274.00	273.68	273.36	274.04	274.02	274.65
4	......	*a*	279.00	279.82	279.85	274.43	274.00	273.68	273.36	273.99	274.02	274.55
5	......	*a*	278.25	279.92	278.80	274.63	274.00	273.68	273.56	273.94	274.02	274.65
6	......	*a*	277.85	281.17	278.00	276.03	273.90	273.68	273.56	273.94	274.02	274.55
7	......	*a*	277.70	283.07	278.40	276.73	273.90	273.58	273.76	273.89	274.02	274.60
8	......	*a*	277.55	284.07	278.35	275.63	273.90	273.53	273.86	273.79	274.02	274.90
9	......	*a*	277.40	282.87	278.00	275.13	273.75	273.43	273.86	273.69	274.12	274.85
10	......	*a*	277.05	282.02	277.65	274.93	273.70	273.38	273.91	273.64	274.07	274.75
11	......	*a*	278.80	278.87	278.50	275.83	273.70	273.28	274.06	273.69	274.02	274.36
12	......	*a*	279.10	277.92	279.85	275.93	273.70	273.28	274.11	273.64	274.02	274.35
13	......	*a*	278.90	278.47	277.95	275.58	273.65	273.33	273.81	273.59	274.02	274.40
14	......	*a*	277.85	281.82	277.25	275.98	273.60	273.38	273.51	273.74	274.02	274.55
15	......	*a*	277.50	285.07	276.80	275.73	273.65	273.28	273.26	273.69	274.06	274.60
16	......	*a*	277.35	284.07	277.40	275.23	273.70	273.43	273.16	273.64	274.05	274.85
17	......	*a*	277.30	282.07	277.65	274.73	273.85	274.48	273.26	273.69	274.05	274.80
18	......	*a*	276.90	281.17	277.40	275.43	273.80	275.03	273.51	273.99	274.20	274.60
19	......	*a*	276.55	280.57	276.80	275.78	273.85	274.78	273.46	274.14	274.25	274.55
20	......	*a*	276.35	280.77	276.45	275.78	273.75	274.73	273.41	274.29	274.45	274.50
21	......	*a*	276.20	280.37	276.00	275.18	273.80	274.68	273.36	274.24	274.55	274.50
22	......	*a*	276.20	279.47	275.55	274.78	273.80	274.48	273.41	274.34	274.60	274.40
23	......	*a*	276.35	279.17	275.40	274.63	273.90	274.08	273.46	274.44	274.80	274.40
24	......	284.00	276.95	278.57	275.30	274.48	274.75	273.68	273.51	275.34	276.00	274.40
25	......	286.05	279.05	278.32	275.10	274.38	275.25	273.68	273.66	275.49	276.00	274.45
26	......	284.75	282.10	277.72	274.95	214.28	275.15	273.58	273.71	275.54	275.00	274.55
27	......	283.65	281.30	277.37	274.85	274.23	274.80	273.63	273.76	274.54	276.55	274.60
28	......	282.60	282.70	278.42	275.05	274.18	274.45	273.68	273.76	274.24	276.85	274.70
29	......	......	281.20	278.12	275.35	274.13	274.20	273.63	273.86	274.09	276.90	275.25
30	......	......	280.40	278.27	275.15	274.13	273.95	273.48	274.01	274.19	277.00	275.50
31	......	......	278.30	......	275.00	......	273.90	273.23	......	274.24	......	275.50

a No record.

MOHAWK RIVER AT CANAJOHARIE, N. Y.

A gaging station was established by this Department at the highway bridge crossing Mohawk river at Canajoharie, September 16, 1908. The gage is of the weight-and-chain variety contained in a box of standard form fastened to the hand railing of the upstream side of the bridge. The gage reads from zero to 11 feet by feet and tenths. Length of gage-chain from end of weight to marker is 42.35 feet. The datum of the gage is 282.45. The drainage area at this gaging station is given as 1,862 square miles in the Barge canal report of 1901. Gage readings are taken each morning and night. The observers were M. J. Powers, from September 16, 1908, to January 31, 1909, and H. M. Hoag, beginning February 1, 1909.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Canajoharie, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	286.20	290.15	292.95	290.35	291.15	286.05	284.80	284.35	283.80	284.14	285.15	286.55
2	286.45	289.80	292.30	290.75	292.35	285.85	284.70	284.20	283.90	284.04	285.10	286.15
3	286.50	289.70	291.70	291.50	291.50	285.50	285.00	284.20	283.90	284.84	285.10	286.10
4	286.45	289.05	291.20	292.10	291.35	285.50	284.75	284.10	283.90	284.89	285.15	286.00
5	286.70	287.95	290.40	291.90	290.30	286.05	285.10	284.00	284.10	284.79	285.10	285.95
6	290.60	293.35	289.60	292.95	289.50	288.20	284.95	284.05	284.35	284.89	285.10	285.70
7	292.10	293.80	289.70	295.30	289.90	287.85	284.80	283.95	284.90	284.69	285.05	285.80
8	291.45	293.30	289.30	296.25	290.00	286.75	284.65	283.70	284.65	284.39	284.95	285.70
9	290.85	293.30	289.05	295.10	290.20	286.25	284.05	283.80	284.55	284.19	285.35	285.45
10	290.35	291.90	289.00	292.55	289.25	286.10	284.30	283.75	284.25	284.24	285.50	285.35
11	289.35	290.75	291.30	290.50	291.40	286.00	284.25	283.65	285.15	284.14	285.40	285.70
12	289.00	290.75	291.75	289.60	291.40	286.20	284.35	283.80	284.75	284.04	285.30	285.85
13	288.45	290.50	291.35	290.20	289.45	286.65	284.45	283.70	284.30	284.54	285.20	286.00
14	288.10	290.50	291.25	295.10	288.80	286.20	284.30	283.55	284.10	284.39	284.95	286.25
15	287.75	290.05	290.80	296.90	288.45	286.70	284.15	283.50	284.15	284.39	284.95	286.40
16	289.65	290.85	289.65	295.80	288.80	286.35	284.70	283.60	284.10	284.34	284.85	286.35
17	289.50	290.85	289.40	293.75	288.90	286.15	284.60	286.60	284.25	284.29	284.35	286.20
18	288.90	290.75	288.70	292.95	288.70	286.95	284.35	286.50	284.05	285.04	286.30	286.05
19	288.85	290.40	288.40	292.20	288.05	287.15	284.40	286.15	283.85	285.84	286.60	285.90
20	288.55	296.35	288.25	293.10	287.50	286.75	284.60	285.50	283.80	285.59	286.15	285.85
21	288.15	296.05	287.90	292.15	287.15	286.35	284.65	285.40	283.65	285.34	286.00	285.85
22	288.05	295.55	287.95	291.05	286.80	286.00	284.50	284.80	283.80	285.74	286.05	285.85
23	288.20	295.15	288.00	290.75	286.80	285.75	284.65	284.65	283.95	286.54	286.80	285.75
24	291.20	294.50	288.80	289.75	286.65	285.55	286.65	284.50	284.45	286.89	287.30	285.70
25	294.15	296.90	292.10	289.20	286.40	285.50	286.75	284.45	284.65	286.59	287.05	285.75
26	294.40	296.85	293.75	289.25	286.20	285.30	286.50	284.30	284.40	286.15	286.55	285.65
27	293.45	295.75	286.00	289.80	286.00	285.25	285.95	284.10	284.25	286.05	286.35	285.75
28	292.10	294.70	292.35	289.80	286.40	285.25	285.40	283.95	284.25	285.50	286.15	285.75
29	291.25	......	291.05	289.65	286.80	285.25	285.00	283.85	284.55	285.45	286.40	285.65
30	290.05	......	289.55	290.00	286.55	285.00	284.70	283.85	284.30	285.20	286.90	285.65
31	289.55	......	289.65	......	286.30	......	284.55	283.75	......	285.25	......	285.75

MOHAWK RIVER AT FORT PLAIN, N. Y.

A gage was established on the highway bridge crossing the Mohawk river at Fort Plain, December 30, 1905, by C. A. Poole, for this Department. A box-and-chain gage is attached to the

Mean Daily Discharge, Second-feet, of East Canada Creek at Dolgeville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	234	383	785	962	2,483	274	206	*105	147	200	262	378
2	149	347	578	1,204	*2,090	218	196	124	154	225	261	333
3	*228	334	713	1,746	2,120	304	204	123	147	*113	265	309
4	257	298	578	*1,921	1,970	256	*128	134	195	175	228	269
5	282	284	339	2,127	2,134	396	169	139	*167	187	208	*143
6	743	628	558	3,167	1,985	*7.9	173	150	185	165	184	293
7	1,140	*864	*474	5,136	2,374	588	186	121	163	175	*147	219
8	948	1,126	425	5,540	1,994	811	174	*85	162	197	325	248
9	806	1,083	360	3,571	*1,635	525	157	105	212	167	297	210
10	*781	933	401	2,752	1,674	779	144	115	256	*95	293	202
11	758	1,054	684	*1,804	2,720	1,203	*99	105	294	155	250	166
12	891	725	816	1,677	1,741	1,049	140	111	*179	161	240	*142
13	202	800	621	2,860	1,267	*788	129	105	165	178	216	206
14	376	*566	*438	7,537	1,141	714	143	163	169	184	*154	228
15	416	1,338	365	6,717	825	611	207	*327	164	165	205	232
16	312	1,055	317	4,576	*1,139	402	209	350	165	113	207	276
17	*294	758	348	3,946	1,127	667	179	554	161	*159	338	199
18	247	1,307	334	*3,815	892	634	*119	631	297	414	461	233
19	155	2,151	408	3,671	622	643	237	516	*463	441	399	*320
20	561	1,598	558	4,755	481	*491	172	344	356	317	372	180
21	382	*2,905	*629	2,745	606	414	145	258	156	324	*234	204
22	343	2,299	606	2,816	521	404	147	*182	151	768	456	19
23	388	2,538	327	2,899	*388	377	272	190	151	618	374	18
24	*1,373	2,361	497	2,283	417	269	763	148	288	*428	434	192
25	1,948	2,360	700	*2,005	380	218	*576	154	217	257	417	185
26	1,596	2,414	782	1,939	419	216	429	173	*129	439	280	*170
27	1,081	2,050	664	2,278	438	*210	297	152	189	381	324	202
28	591	*1,587	*415	2,085	455	283	230	338	218	283	*255	190
29	480	......	510	2,227	582	234	195	*263	218	300	443	179
30	509	......	691	1,880	*458	212	190	134	218	302	460	190
31	*563	......	654	......	480	......	201	156	......	*162	......	161
Mean	616	1,291	535	3,088	1,232	499	220	211	[illegible]	266	300	221

* Indicates Sundays.

Monthly Discharge of East Canada Creek at Dolgeville, N. Y.
[Drainage area, 256 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	1,948	149	616	2.41	2.77
February	2,905	284	1,291	5.05	5.25
March	816	317	535	2.09	2.40
April	7,537	962	3,088	12.06	13.51
May	2,720	380	1,232	4.81	5.53
June	1,203	210	499	1.95	2.16
July	763	99	220	0.860	0.989
August	631	85	211	0.825	0.949
September	463	129	204	0.797	0.885
October	768	95	266	1.04	1.20
November	460	147	300	1.17	1.31
December	378	142	221	0.864	0.994

MOHAWK RIVER AT LITTLE FALLS, N. Y.

A gaging station was established at the lower (Gilbert's) dam at Little Falls, N. Y., for the United States Board of Engineers on Deep Waterways in 1898. It has since been maintained by the

U. S. Geological Survey in coöperation with this Department. The dam is of masonry, having the form of a circular arc, and furnishes power for the Astoronga Knitting Mill and the mill of the Little Falls Paper Company. Records of the crest gage and run of the water-wheels at the Astoronga mill are taken by John Schmelze. At the paper mill a record has been kept, beginning June 1, 1907, by C. T. Barrett.

There are three dams at Little Falls. The upper one is a State dam, diverting water for the supply of the Erie canal; the lower two are used for water-power development. The gage record kept at the lower dam shows the amount of water flowing down-stream from Little Falls, but does not include the diversion at the State dam above the gaging station, and hence does not represent the total yield from the tributary drainage area of about 1,306 square miles.

Mean Daily Discharge, Second-feet, of Mohawk River at Little Falls, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1,096	1,400	5,003	6,625	6,628	1,492	688	*816	729	824	1,120	1,963
2	1,026	1,540	3,738	7,177	*8,825	1,443	792	924	848	946	1,042	1,664
3	*1,022	1,531	3,457	7,664	8,081	1,404	900	886	753	*990	1,042	1,621
4	1,227	1,486	3,331	*8,062	7,318	1,245	*637	834	657	1,085	1,120	1,569
5	2,091	1,622	2,258	8,091	5,701	1,855	838	766	*492	1,000	1,085	*1,033
6	6,201	5,133	1,892	10,036	5,782	*4,541	916	933	1,404	911	1,154	1,514
7	6,135	*5,761	*1,728	13,788	6,133	3,686	959	808	1,122	662	*887	1,391
8	4,748	6,108	1,988	16,327	6,599	2,236	894	*691	936	629	1,154	1,391
9	3,548	5,516	1,762	13,488	*5,478	1,790	733	628	733	679	1,189	1,353
10	*4,956	3,520	2,228	8,895	5,464	2,000	658	645	791	*720	1,313	1,090
11	2,518	3,206	4,442	*5,823	8,675	2,640	*774	828	547	816	1,189	660
12	2,121	3,260	4,831	4,915	8,370	2,664	894	688	*561	777	1,189	*947
13	1,555	3,159	4,044	6,490	5,767	*1,839	852	688	732	800	977	1,135
14	1,352	*2,866	*4,601	13,688	4,164	2,281	928	448	861	676	*846	1,135
15	1,663	2,541	2,955	16,184	3,452	2,152	749	*415	754	769	919	1,301
16	1,381	3,078	2,708	14,279	*4,402	1,796	799	951	580	704	977	1,505
17	*841	2,881	2,546	10,482	5,065	1,570	882	1,383	493	*838	1,225	1,326
18	1,141	3,133	1,944	*10,089	4,312	2,210	*708	1,591	555	1,563	2,287	1,116
19	1,029	2,688	1,883	8,883	3,430	2,532	834	1,396	*563	1,387	2,340	*1,163
20	1,138	8,144	1,838	9,992	2,808	*1,895	1,011	1,1[illegible]6	714	1,348	1,665	1,213
21	1,195	*9,541	*1,505	8,290	2,139	1,748	895	1,114	641	1,116	*1,726	1,213
22	1,439	9,926	1,398	7,184	1,964	1,483	895	*838	890	1,387	1,976	1,217
23	1,979	7,758	1,349	6,754	*2,366	1,365	1,154	906	800	2,448	2,865	1,146
24	*5,509	8,152	2,150	5,955	2,012	1,206	1,740	906	777	*2,313	3,288	924
25	8,800	10,553	6,004	*4,486	1,705	1,206	*2,361	877	794	2,001	2,688	1,017
26	10,377	8,801	6,797	4,338	1,443	1,206	2,053	906	*837	1,606	2,220	*919
27	7,414	7,949	7,026	3,629	1,398	*1,353	1,514	632	754	1,309	1,820	1,034
28	5,729	*6,665	*6,657	5,020	2,049	1,073	1,119	549	666	1,309	*1,526	1,077
29	3,801	......	6,006	4,721	1,808	962	1,051	*692	800	1,274	2,224	1,146
30	2,540	......	5,400	4,960	*1,769	702	915	661	589	1,154	2,665	936
31	*2,163	......	5,650	....	1,888	......	828	706	......	*918	......	842
Mean	3,153	4,926	3,517	8,544	4,387	1,852	999	849	746	1,128	1,591	1,212

* Indicates Sundays.

Monthly Discharge of Mohawk River at Little Falls, N. Y.
[Drainage area, 1,306 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	10,377	841	3,153	2.41	2.77
February	10,553	1,400	4,926	3.77	3.92
March	7,026	1,349	3,517	2.69	3.09
April	16,327	3,629	8,544	6.54	7.32
May	8,825	1,398	4,387	3.36	3.86
June	4,541	702	1,852	1.42	1.59
July	2,361	637	999	0.765	0.880
August	1,591	415	849	0.650	0.748
September	1,404	492	746	0.571	6.40
October	2,448	629	1,128	0.864	0.994
November	3,288	846	1,591	1.22	1.37
December	1,963	660	1,212	0.928	1.07

MOHAWK RIVER ABOVE STATE DAM AT LITTLE FALLS, N. Y.

This gage was established November 18, 1904, by E. A. Lamb and is maintained by this Department in coöperation with the United States Weather Bureau. A vertical gage with painted tenth-foot marks reading from zero to 12 feet is attached to the down-stream portal wall of the discharge culvert of Erie canal waste-weir No. 12 on the right-hand bank of Mohawk river 400 feet up-stream from Hansen avenue. The State dam at Little Falls is a low, timber structure located on the ledge at the head of the falls. The stream is divided by an island, the left-hand wing of the dam being at the upper and the right-hand wing at the lower end of the island. The old Erie canal at the left-hand end of the dam is utilized as a mill-race. At the right-hand end water is diverted for power purposes through Whitman's race. The Erie canal feeder is also located at the right-hand end of the dam. Measurements to determine the flow in these channels during 1909 are given in the accompanying tables. The elevation of the zero mark of the gage is at 360.31. Readings were taken each morning and afternoon by William Quackenbush, preceding December 1, 1907, and by John Stark after that date.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River above State Dam at Little Falls, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	363.61	364.06	365.01	365.46	365.56	363.71	363.41	363.41	363.81	364.01	363.51	363.91
2	363.61	363.91	364.76	365.46	366.11	363.51	363.31	363.31	363.81	364.01	363.51	363.91
3	363.61	363.81	364.61	365.31	366.01	363.51	363.31	363.31	363.81	364.21	363.51	363.91
4	363.61	363.81	364.46	366.01	65.71	363.71	363.31	363.31	363.91	364.11	363.51	363.71
5	364.11	363.81	364.21	366.01	365.31	364.46	363.36	363.31	363.91	364.11	363.51	363.71
6	365.56	365.11	364.11	366.51	365.11	364.71	363.51	363.21	364.11	364.11	363.51	363.71
7	365.46	365.31	364.21	367.61	367.61	364.41	363.51	364.21	364.11	364.11	363.51	363.71
8	365.06	365.31	364.01	368.16	365.36	364.21	363.31	363.21	364.11	364.01	363.51	363.61
9	364.66	365.21	364.01	367.51	365.26	363.96	363.31	363.11	364.11	364.01	363.51	363.61
10	364.61	364.61	364.36	366.31	364.91	363.86	363.31	363.11	364.11	364.01	363.51	363.61
11	364.41	364.41	364.91	365.41	365.51	364.21	363.31	363.91	364.11	364.01	363.51	363.51
12	364.26	364.51	364.91	364.91	365.71	364.06	363.31	363.81	363.91	364.01	363.51	363.41
13	363.91	364.51	364.66	365.21	365.11	364.01	363.31	363.71	363.81	363.91	363.51	363.41
14	363.81	364.41	364.51	367.51	365.11	363.96	363.31	363.66	363.81	363.91	363.51	363.61
15	363.91	364.41	364.41	368.11	365.11	363.91	363.31	363.71	363.81	363.91	363.31	363.61
16	363.91	364.41	364.41	367.51	364.81	363.81	363.31	364.06	383.81	363.91	363.31	363.61
17	363.91	364.41	364.31	366.66	364.86	363.71	363.31	364.31	363.81	364.11	363.51	363.71
18	363.81	364.31	364.01	366.31	364.61	363.71	363.51	364.31	363.91	364.31	363.51	363.71
19	363.76	364.41	363.91	366.11	364.51	364.06	363.51	364.16	364.11	364.31	363.66	363.71
20	363.81	366.06	363.91	366.36	364.31	363.91	363.41	364.11	363.81	364.31	363.71	363.61
21	363.81	366.31	363.91	365.91	364.11	363.76	363.36	363.91	363.81	364.31	363.71	363.61
22	363.81	366.81	363.91	365.71	364.01	363.61	363.31	363.91	363.81	364.31	363.76	363.61
23	364.01	366.11	363.91	365.51	364.01	363.51	363.51	363.91	363.81	364.71	363.71	363.61
24	365.41	365.91	364.21	365.21	364.01	363.51	364.06	363.91	364.01	364.81	364.21	363.61
25	366.26	366.76	365.41	364.81	363.81	363.51	364.11	363.91	363.96	364.71	364.16	363.61
26	366.81	366.31	365.76	364.61	363.81	363.51	364.06	363.91	364.11	364.71	363.91	363.61
27	365.76	366.06	365.61	364.51	363.81	363.51	363.91	363.81	364.01	364.71	363.81	363.61
28	365.31	365.71	365.46	364.61	363.71	363.51	363.56	363.81	364.01	364.71	363.81	363.61
29	364.76	......	365.41	364.61	363.81	363.51	363.41	363.81	364.01	363.51	363.81	363.61
30	364.31	......	365.16	364.91	363.81	363.51	363.41	363.81	364.01	363.51	363.71	363.61
31	364.26	......	365.01	......	363.81	......	363.41	363.81	......	363.51	......	363.61

Current-meter Discharge Measurements of Little Falls Paper Co.'s Head-race, Little Falls, N. Y.

DATE.	Hydrographer.	Gage height.a	Area of section.	Mean velocity.	Dis-charge.
		Feet.	*Square feet.*	*Ft. per second.*	*Second-feet.*
1909.					
Aug. 20...	Newton and Angus..................	8.90	115	2.71	312

a Reference point is top of wall, left-hand, down-stream side of bridge across raceway.

Current-meter Discharge Measurements of Upper Gilbert Mill-race (Old Erie Canal), Little Falls, N. Y.

DATE.	Hydrographer.	Gage height.a	Area of section.	Mean velocity.	Dis-charge.
		Feet.	*Square feet.*	*Ft. per second.*	*Second-feet.*
1909.					
Aug. 19	Newton and Angus..................	8.95	70.80	3.47	246
Dec. 13	E. C. Niles...........................	8.60	47.20	4.51	213

a Below reference point.

NOTE.— The same reference point was not used for both measurements.

Current-meter Discharge Measurements of Erie Canal Feeder at Bellinger St., Little Falls, N. Y.

DATE.	Hydrographer.	Gage height.[a]	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
Aug. 18	J. P. Newton........................	6.00	77.1	0.559	43.1

[a] Below reference point.

Current-meter Discharge Measurements of Whitman's Race, Little Falls, N. Y.

DATE.	Hydrographer.	Gage height.[a]	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
Aug. 18	J. P. Newton........................	2.20	163	1.37	223
Dec. 13	E. C. Niles..........................	2.95	122	1.25	153

[a] Reference point is top of spike in wall, right-hand, down-stream side of bridge across race.

ERIE CANAL NEAR LITTLE FALLS, N. Y.

Current-meter measurements of the flow in Erie canal at the first bridge west of Little Falls were made during 1909, as shown in the accompanying table.

Current-meter Discharge Measurements of Erie Canal at First Bridge West of City Limits, Little Falls, N. Y.

DATE.	Hydrographer.	Gage height.[a]	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
Aug. 18[b]	J. P. Newton........................	5.70	447	0.345	154

[a] Below reference point.
[b] Initial point is at face of left-hand, down-stream abutment. Reference point is the top of lower step of down-stream, right-hand abutment.

MOHAWK RIVER NEAR HERKIMER, N. Y.

This gaging station, which is located at the highway bridge over the Mohawk river between Herkimer and Mohawk, was established November 23, 1904, by C. A. Poole for this Department. The gage is a vertical board secured to the left-hand, or north abutment of the bridge. The gage is in two sections reading from zero to 3.4 feet and from 3.4 to 15.0 feet, respectively. It is graduated in feet and tenths and the elevation of zero is 377.43. Observations of the state of the stream are taken twice each day by Henry Edick, Jr.

Preceding the fall of 1908 current-meter measurements were made from the down-stream side of the bridge. Later measurements have been made from the up-stream side of bridge, which has a single span of 124.3 feet. The river channel is of uniform cross-section and straight for several hundred feet below the bridge. About 200 feet above the bridge there is a slight bend to the south. During extreme high water the river overflows its banks and flows through additional openings in the dike formed by the highway, and it is necessary to measure this additional flow in order to get the total flood discharge at this station.

This gaging station is located about one and one-quarter miles above the junction of the Mohawk river and West Canada creek. The drainage area of West Canada creek, above its junction with the Mohawk river, is 583 square miles and the drainage area of the Mohawk, above the same point, is about 712 square miles.

The stream channel is obstructed by aquatic grass during the summer months, so that there is not a constant relation between gage height and discharge.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River near Herkimer, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	378.53	380.28	383.78	383.63	382.73	378.38	378.53	378.78	378.88	378.88	378.83	379.38
2	378.43	380.18	382.13	383.53	383.48	378.28	378.53	378.83	378.93	379.13	378.78	379.08
3	378.33	380.18	381.48	384.43	384.28	378.23	378.63	378.73	378.93	379.13	378.73	379.03
4	378.58	380.53	381.28	384.58	383.83	378.13	378.88	378.78	378.88	379.03	378.83	378.78
5	380.03	381.63	380.33	384.48	381.98	379.33	378.68	378.88	378.98	378.93	378.73	378.83
6	383.28	384.58	380.08	385.13	380.38	381.53	378.83	378.83	379.18	378.93	337.63	378.78
7	383.48	384.73	379.78	385.93	380.53	380.83	378.68	378.88	379.18	379.03	378.63	378.78
8	384.98	384.63	379.43	386.13	380.53	379.33	378.53	378.98	379.08	378.93	378.68	378.93
9	385.13	383.98	379.48	385.98	380.23	378.78	378.58	378.93	378.98	378.83	378.68	378.83
10	383.68	383.18	379.73	384.73	380.73	378.73	378.48	378.98	378.88	378.88	378.58	378.68
11	382.98	382.23	381.93	383.33	381.93	379.68	378.78	378.83	379.08	378.73	378.53	378.53
12	382.38	381.98	382.58	380.28	382.53	379.53	378.93	378.83	378.98	378.63	378.48	378.58
13	381.88	381.83	380.93	381.78	380.88	378.98	378.63	378.73	378.88	378.63	378.48	378.68
14	381.53	381.18	380.18	383.68	379.83	379.08	378.73	378.78	378.83	378.73	378.43	378.78
15	381.38	380.98	379.98	385.58	379.53	378.98	378.08	378.68	378.73	378.68	378.48	378.83
16	381.18	381.28	379.93	385.83	380.68	378.78	378.78	378.73	378.93	378.63	378.63	378.88
17	380.98	381.53	379.88	384.63	381.23	378.73	378.83	379.08	379.18	378.73	379.03	378.88
18	380.88	381.53	379.43	383.18	380.88	379.23	378.78	379.38	379.08	378.83	379.58	378.88
19	380.53	381.88	379.28	382.48	380.18	379.43	378.83	379.73	378.98	378.93	379.48	378.83
20	380.78	385.73	379.13	381.98	379.63	378.93	379.08	379.38	378.88	379.03	379.38	378.78
21	380.98	386.23	378.98	381.53	379.28	378.63	378.98	379.23	378.83	379.13	379.28	378.83
22	381.23	386.28	378.93	381.13	379.03	378.48	378.78	378.93	378.78	379.18	379.38	378.78
23	382.73	385.73	379.03	381.13	378.68	378.43	379.23	378.88	378.78	379.08	379.23	378.78
24	385.88	385.43	380.13	380.28	378.58	378.43	380.03	378.78	379.08	379.88	379.23	378.83
25	386.68	386.43	382.53	379.78	378.48	378.48	379.48	378.83	379.28	379.78	379.23	378.73
26	386.68	385.98	384.13	379.63	378.38	378.43	379.33	378.83	379.08	379.38	379.08	378.83
27	385.33	385.83	384.93	379.53	378.43	378.48	379.23	378.83	378.98	379.13	378.98	378.78
28	384.68	385.13	384.28	379.68	378.98	378.48	379.18	378.83	379.08	378.83	378.93	378.78
29	382.28	......	383.53	379.98	378.88	378.53	378.88	378.83	378.98	378.88	379.53	378.73
30	380.68	......	383.08	380.53	378.68	378.38	378.88	378.83	378.88	378.88	379.93	378.63
31	380.38	......	382.83	......	378.48	......	378.83	378.83	......	378.88	......	378.73

Current-meter Discharge Measurements of Mohawk River near Herkimer, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
April 20	Clark and Niles	4.62	1,060	3.17	3,363
May 13	E. C. Niles	3.20	770	2.59	1,996
May 24	Clark and Angus	1.2	528	1.36	720
July 28	Niles and Angus	2.3	655	0.93	611

WEST CANADA CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

West Canada creek rises in West Canada lakes, in southwest-central Hamilton county, and flows southwestward, then southeastward into the Mohawk at Herkimer, N. Y.

The drainage area is shown on the Utica, Little Falls, Remsen, Wilmurt, Old Forge and Canada lakes quadrangles, U. S. Geological Survey topographic map.

There are about fifty small lakes and a few undrained ponds in the watershed of the stream. Most of these are situated near the head waters and above the gaging station, the largest single water-surface being Honnedega lake, 1.4 square miles in extent. There is also a small amount of controllable storage, in reservoirs formed by three dams. Swamps and marshes are numerous in the region of the head waters, usually adjoining lakes and tributaries and having an extent of one-half square mile or less each.

Much of the region above Twin Rock is timber-covered. There are extensive sand areas in the central and upper drainage basins. The soil of the upper watershed is underlaid by granitic gneiss usually at or near the surface, excepting in alluvial valleys. From a point just above Twin Rock bridge and extending down stream beyond Trenton Falls, the underlying geological formation is Trenton limestone.

Compacted snow accumulates in the woodlands in winter, often to a depth of three or four feet, and representing an inch of water for each five or six inches of snow. This melts slowly, feeding the stream in March and April, which months may show a run-off greatly exceeding the precipitation.

In order to determine the precipitation on the drainage basin of upper West Canada creek, three rainfall and snow-gage stations were established in the fall of 1905. The gages were erected by Daniel L. Mott. The observers are as follows:

Hoffmeister's.— Mrs. Augustus H. Hoffmeister.
North Lake.— George C. Paull.
Honnedaga.— A. D. Barber. (Abandoned.)
Twin Rock.— Frank McArthur. (Established in 1908.)
Trenton Falls.— C. W. Young. (Established in 1908.)

The results of gagings at a station formerly maintained on this stream at Middleville are given in the report of the State Engineer and Surveyor for 1902, Supplement, pages 145–149.

WEST CANADA CREEK AT KAST BRIDGE NEAR HERKIMER, N. Y.

This gaging station, which is located on West Canada creek about four miles from its junction with the Mohawk river, was established May 15, 1905, by Robert E. Horton, hydrographer, U. S. Geological Survey. The station has since been maintained by this Department.

The gage is of the weight-and-reel type and is placed in a box secured to the north railing of bridge at first panel point from east abutment. The readings are taken by measuring down from a scale in the box to the water-surface by means of an iron weight suspended by graduated tape, which is attached to the reel. The scale in box is one foot long, graduated to tenths and hundredths, with its zero at elevation 464.04. The end of weight used to locate the water-surface is 49.80 feet from zero of tape, which is graduated to feet. The elevation of bottom of weight, when zero of tape is opposite zero of scale, is, therefore, 414.24. The elevation of bench-mark on north end of bridge-seat of right-hand abutment is 458.02.

Observations are taken twice daily by Lloyd Kast.

Discharge measurements are made from the down-stream side of the bridge, to which the gage tape is attached. The initial point for soundings is the top face of the left abutment, down-stream side. The drainage area at this point is 574 square miles, or 58 per cent greater than at Twin Rock bridge.

This portion of the basin is underlain by Hudson river and Trenton shales. The topography is moderately rolling. The soil is ordinarily rather impervious and usually under culture. The precipitation and snow storage are considerably less than in the upper part of the drainage area.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of West Canada Creek at Kast Bridge near Herkimer, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	442.86	443.20	444.12	444.57	445.62	443.08	442.44	442.34	442.32	442.63	442.76	443.24
2	443.02	443.30	443.92	444.73	446.10	442.96	442.48	442.34	442.10	442.70	442.77	442.94
3	442.99	443.18	443.[illegible]6	445.30	445.46	442.80	442.64	442.44	442.45	442.76	442.80	443.04
4	443.00	443.14	443.75	445.10	444.88	442.70	442.74	442.32	442.46	442.66	442.70	443.05
5	443.48	443.19	443.38	445.50	444.86	443.40	442.83	442.36	442.68	442.58	442.92	443.05
6	445.28	445.18	443.44	446.04	444.70	444.17	442.66	442.48	442.94	442.28	442.81	443.00
7	445.38	444.64	443.33	447.16	445.52	443.72	442.56	442.38	*a*	442.43	442.74	442.94
8	445.23	444.86	443.28	447.62	445.87	443.34	442.36	442.30	*a*	442.41	442.84	442.88
9	444.28	444.42	443.28	446.56	445.38	443.16	442.38	442.18	*a*	442.60	442.92	442.64
10	444.02	444.14	443.44	445.58	445.57	443.28	442.38	442.32	*a*	442.56	442.93	442.59
11	443.98	444.05	443.96	444.74	446.60	443.66	442.50	442.27	442.57	442.14	442.92	442.75
12	443.68	443.96	443.92	444.58	446.02	443.49	442.50	442.32	442.27	442.57	442.86	442.76
13	443.28	443.92	443.76	445.46	445.13	443.38	442.40	442.34	442.30	442.50	442.72	442.77
14	443.13	443.72	443.58	447.96	444.36	443.35	442.24	442.25	442.26	442.40	442.74	443.06
15	443.42	443.82	443.53	448.16	444.22	443.34	442.32	442.26	442.34	442.56	442.63	442.96
16	443.16	443.71	443.48	447.00	444.70	443.20	442.46	442.58	442.37	442.62	442.78	442.97
17	442.78	444.14	443.34	446.50	444.57	443.04	442.44	442.80	442.46	442.72	442.77	442.90
18	442.96	444.10	443.25	446.64	444.40	443.46	442.42	442.88	442.18	443.18	443.29	442.92
19	*a*	443.94	443.19	446.38	444.11	443.50	442.34	442.93	442.02	443.16	443.28	442.80
20	446.18	446.30	443.20	447.40	443.84	443.38	442.43	442.76	442.15	442.92	443.09	442.86
21	445.74	446.00	443.10	446.46	443.64	443.18	442.28	442.48	442.34	442.76	443.05	442.84
22	445.26	445.76	443.16	445.96	443.68	443.03	442.28	442.38	442.36	443.12	443.20	442.90
23	445.14	445.18	443.11	445.86	443.88	442.77	442.83	442.54	442.40	443.86	443.89	442.98
24	445.50	446.05	443.34	*a*	443.36	442.72	443.12	442.56	442.46	443.81	444.06	442.68
25	446.00	446.36	444.63	*a*	443.25	442.82	443.55	442.22	442.28	443.38	443.78	442.86
26	445.80	445.92	444.44	*a*	443.08	442.57	443.41	442.41	442.64	443.10	443.58	442.78
27	444.90	445.31	443.98	445.38	443.03	442.80	443.02	442.26	442.30	442.95	443.27	442.77
28	444.42	444.60	444.01	445.62	443.42	442.57	442.71	442.39	442.44	442.98	443.20	442.93
29	443.93	......	444.18	445.40	443.52	442.64	442.46	442.33	442.46	442.94	443.46	442.74
30	443.80	......	444.04	445.58	443.25	442.49	442.62	442.40	442.53	442.80	443.44	442.68
31	443.46	......	444.10	......	443.27	......	442.58	442.29	......	442.89	......	*a*

a No record.

Current-meter Discharge Measurement of West Canada Creek at Kast Bridge near Herkimer N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
		Feet.	*Square feet.*	*Ft. per second.*	*Second-feet.*
1909.					
April 20	Clark and Niles	33.18	......	......	*a*
April 27	E. C. Niles	30.82	......	......	*a*
May 24	Clark and Angus	29.28	465	2.32	1,079
July 28	Niles and Angus	29.14	454	2.37	1,076
Sept. 14	E. C. Niles	28.29	302	1.16	351

a No discharge computed at this time, owing to lack of meter rating.

Mean Daily Discharge, Second-feet, of West Canada Creek at Kast Bridge near Herkimer, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	a562	a811	1,875	2,648	5,238	723	333	285	276	423	489	840
2	a680	a891	1,595	2,978	6,790	636	351	285	188	456	497	621
3	a658	a797	1,525	4,295	4,802	518	428	333	338	489	518	694
4	a665	a767	1,385	3,796	3,324	456	475	276	342	437	456	701
5	a1,095	a804	993	4,875	3,265	993	5 1	295	446	399	606	701
6	a4,295	a4,032	1,044	6,620	2,878	1,945	437	351	621	257	526	665
7	4,585	2,786	942	11,248	4,948	1,324	390	304	......	328	474	621
8	4,150	3,265	891	13,700	6,025	942	295	267	......	319	548	577
9	2,142	2,372	891	8,470	4,585	782	304	215	......	409	606	428
10	1,735	1,910	1,044	5,165	5,092	891	304	276	......	390	614	404
11	1,700	1,805	1,665	2,978	8,665	1,299	361	252	394	200	606	482
12	a1,299	1,665	1,595	2,694	6,535	1,095	361	276	252	394	562	489
13	a891	1,595	1,385	4,802	3,914	993	314	285	267	361	465	497
14	a760	1,324	1,197	15,840	2,280	955	238	243	248	314	475	708
15	a1,018	1,455	1,146	17,120	2,015	942	276	248	285	390	423	636
16	a782	1,3 4	1,095	10,425	2,878	811	342	399	299	418	504	643
17	a504	1,910	942	8,275	2,648	694	333	51	342	465	497	591
18	a636	1,840	853	8,860	2,326	1,070	323	651	215	797	891	606
19	a	1,630	804	7,885	1,875	1,095	285	614	165	782	881	518
20	a7,130	7,495	811	12,440	1,490	993	328	489	204	606	730	562
21	a5,600	6,450	737	8,178	1,248	797	257	351	285	489	701	548
22	a4,222	5,685	782	6,365	1,299	687	257	304	295	752	811	591
23	a3,914	4,032	745	6,025	1,560	497	541	380	314	1,525	1,560	651
24	a4,875	6,705	942	......	968	465	752	390	342	1,455	1,805	446
25	6,450	7,788	2,786	......	853	533	1,172	230	257	983	1,406	562
26	5,770	6,195	2,418	......	723	394	1,018	319	428	737	1,186	504
27	3,324	4,368	1,700	4,585	687	518	680	243	267	628	866	497
28	2,372	2,694	1,735	5,238	1,018	394	461	309	333	651	811	614
29	1,630	......	1,980	4,585	1,120	428	342	280	342	621	1,070	475
30	1,420	......	1,770	5,165	853	356	418	314	375	518	1,044	446
31	a1,070	......	1,840	......	866	......	399	262	......	584	......	......
Mean	2531	3,018	1,326	7,232	2,993	808	430	330	312	567	754	577

a Excessive ice obstruction.

Monthly Discharge of West Canada Creek at Kast Bridge near Herkimer, N. Y.
[Drainage area, 574 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	7,130	562	2,531	4.41	5.07
February	7,788	767	3,018	5.26	5.47
March	2,786	737	1,326	2.31	2.66
April	17,120	2,648	7,232	12.62	14.13
May	8,665	687	2,993	5.21	5.99
June	1,945	356	808	1.41	1.58
July	1,172	257	430	0.749	0.861
August	651	215	330	0.575	0.661
September	621	165	312	0.544	0.609
October	1,525	200	567	0.988	1.14
November	1,805	423	754	1.31	1.47
December	840	404	577	1.01	1.16

WEST CANADA CREEK AT POLAND, N. Y.

A gaging station was established by this Department on West Canada creek at the first highway bridge below the village of Poland, July 3, 1908. The gage is of the weight-and-chain variety, contained in a box of standard form, which is fastened to the hand railing of the down-stream side of the bridge near the left-hand end. Length of chain from end of weight to copper rivet marker is 22.65 feet. The gage is read each morning and night by Harrison Fisher. Current-meter measurements obtained during 1908–1909 established a consistent rating curve for low stages of the stream. The accompanying discharge tables have been deduced by the use of this curve. These results are believed to be substantially correct, but may be revised upon completion of the rating curve of a wider range of stages.

The drainage area at point of gaging is 470 square miles.

Mean Daily Gage Height, in Feet, of West Canada Creek at Poland, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	3.80	4.30	5.15	4.80	6.75	4.05	3.22	3.27	3.12	3.50	3.70	4.05
2	3.65	4.10	4.90	5.40	7.50	3.90	3.22	3.47	3.17	3.45	3.65	3.90
3	3.60	4.00	4.60	5.90	6.50	3.80	3.37	3.27	3.27	3.60	3.60	3.90
4	3.60	4.00	4.50	6.40	5.95	3.85	3.57	3.27	3.22	3.60	3.60	3.80
5	3.15	4.00	4.40	6.15	5.85	4.95	3.67	3.32	3.37	3.55	3.70	3.80
6	5.40	5.10	4.40	6.80	5.50	5.75	3.52	3.27	4.02	3.25	3.70	3.75
7	6.65	5.55	4.20	8.25	6.60	4.70	3.47	3.17	3.82	3.30	3.45	3.75
8	6.00	5.30	4.15	9.70	7.20	4.30	3.22	3.22	3.52	3.25	3.65	3.70
9	5.65	5.00	4.20	8.40	7.10	4.10	3.22	3.42	3.32	3.45	3.70	3.35
10	5.45	5.10	4.20	7.10	7.50	4.10	3.12	3.27	3.37	3.35	3.80	3.30
11	5.35	5.00	4.50	6.10	7.85	4.15	3.17	3.32	3.52	3.30	3.70	3.50
12	5.05	5.00	4.85	5.80	7.75	4.40	3.32	3.17	3.32	3.35	3.65	3.75
13	4.80	4.90	4.75	6.30	6.85	4.30	3.12	3.22	3.32	3.25	3.60	3.60
14	4.50	4.70	4.40	9.95	5.70	4.35	3.27	3.22	3.32	3.30	3.40	3.70
15	4.25	4.75	4.20	10.05	5.45	4.40	3.27	3.22	3.22	3.30	3.60	3.80
16	4.30	4.80	4.10	8.90	5.60	4.30	3.07	3.37	3.17	3.40	3.50	3.75
17	4.15	4.65	4.00	8.35	5.65	4.15	3.27	3.47	3.12	3.45	3.50	3.70
18	4.00	4.50	4.10	8.50	5.55	4.30	3.32	3.87	3.22	4.25	4.40	3.70
19	4.15	4.75	4.05	8.10	5.25	4.50	3.52	3.77	2.92	3.95	4.10	3.50
20	4.10	6.20	4.05	8.90	4.85	4.15	3.32	3.52	3.32	3.70	3.95	3.70
21	3.70	7.20	4.05	8.25	4.80	4.10	3.32	3.32	3.27	3.60	3.85	3.70
22	4.00	6.30	4.00	7.60	4.85	3.95	3.32	3.27	3.17	4.05	4.30	3.70
23	4.45	6.20	4.15	7.55	4.85	3.80	3.72	3.27	3.32	5.00	5.20	3.60
24	5.65	6.45	4.45	7.30	4.40	3.75	4.12	3.32	3.12	4.80	5.30	3.75
25	7.05	7.90	5.30	6.80	4.20	3.75	4.22	3.17	3.37	4.40	4.90	3.35
26	6.95	7.25	5.30	6.55	4.00	3.65	3.97	3.17	3.67	4.25	4.45	3.60
27	5.95	6.40	4.85	6.40	3.90	3.50	3.77	3.07	3.27	4.05	4.15	3.70
28	5.40	5.65	4.90	6.80	4.35	3.45	3.37	3.07	3.27	3.90	4.10	3.55
29	5.05	......	5.15	6.50	4.50	3.40	3.47	3.22	3.32	3.80	4.35	3.55
30	4.70	......	5.05	6.35	4.20	3.35	3.47	3.17	3.42	3.75	4.35	3.55
31	4.40	......	4.70	......	4.15	......	3.32	3.12	......	3.70	......	3.50

Mean Daily Discharge, Second-feet, of West Canada Creek at Poland, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	508	814	1,552	1,202	4,020	652	228	249	188	355	455	652
2	430	684	1,296	1,855	5,500	564	228	341	208	332	430	564
3	405	620	1,032	2,584	3,575	508	295	249	249	405	405	564
4	405	620	950	3,405	2,662	536	390	249	228	405	405	508
5	200	620	882	2,986	2,506	1,343	440	272	295	380	455	508
6	1,855	1,498	882	4,114	1,990	2,350	365	249	633	240	455	480
7	3,842	2,062	748	7,300	3,753	1,114	341	208	519	262	332	480
8	2,740	1,725	712	11,125	4,878	814	228	228	365	240	430	455
9	3,206	1,390	748	7,690	4,684	684	228	318	272	332	455	286
10	1,820	1,498	748	4,684	5,500	684	188	249	295	286	508	263
11	1,790	1,390	950	2,904	6,315	712	208	272	365	263	455	355
12	1,444	1,390	1,249	2,428	6,075	882	272	208	272	286	430	480
13	1,202	1,296	1,155	3,235	4,208	814	188	228	272	240	405	405
14	950	1,114	882	*11,800	3,278	848	249	228	272	263	309	455
15	780	1,155	748	*12,000	1,820	882	249	228	228	263	405	508
16	814	1,202	684	9,000	3,134	814	168	295	208	309	355	480
17	712	1,073	620	7,560	3,206	712	249	341	188	332	355	455
18	620	950	684	7,950	2,062	814	272	547	228	780	882	455
19	712	1,155	652	6,925	1,660	950	365	491	108	592	684	355
20	684	3,068	652	9,000	1,249	712	272	365	272	455	592	455
21	455	4,878	652	7,300	1,202	684	272	272	249	405	536	455
22	620	3,235	620	5,730	1,249	592	272	249	208	652	814	455
23	916	3,068	712	5,615	1,249	508	465	249	272	1,390	1,606	405
24	3,206	3,490	916	5,080	882	480	695	272	188	1,202	1,725	480
25	4,587	6,435	1,725	4,114	748	480	761	208	295	882	1,296	286
26	4,396	4,975	1,725	3,664	620	430	603	208	440	780	916	405
27	2,662	3,405	1,249	3,405	564	355	491	168	249	652	712	455
28	1,855	3,206	1,296	4,114	848	332	295	168	249	564	684	380
29	1,444	......	1,552	3,575	950	309	341	228	272	508	848	380
30	1,114	......	1,444	3,320	748	286	341	208	318	480	848	380
31	882	......	1,114	....	712	......	272	188	......	455	......	355
Mean	1,524	2,072	995	5,522	2,640	728	330	266	280	484	640	439

* Estimated.

Monthly Discharge of West Canada Creek at Poland, N. Y.
[Drainage area, 470 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	4,587	200	1,524	3.24	3.73
February	6,435	620	2,072	4.41	4.59
March	1,725	620	995	2.12	2.44
April	12,000	1,202	5,522	11.75	13.16
May	6,315	564	2,640	5.62	6.46
June	2,350	286	728	1.55	1.74
July	761	168	330	0.702	0.807
August	547	168	266	0.566	0.651
September	633	108	280	0.596	0.668
October	1,390	240	484	1.03	1.18
November	1,725	309	640	1.36	1.52
December	652	263	439	0.934	1.07

WEST CANADA CREEK ABOVE MORGAN DAM, TRENTON FALLS, N. Y.

A gage was established February 8, 1904, by E. A. Lamb on the right-hand bank of West Canada creek about 100 feet up-stream from Morgan dam. The gage is attached to a large cedar tree and consists of a vertical board with painted tenth-foot stripes and reads from zero to 14 feet. The gage is located about 1,200 feet down-stream from the power-plant of the Utica Gas & Electric Co., at Trenton Falls. Its zero mark is at elevation 751.03. Readings are taken each morning and night by C. W. Young. The gage is maintained by this Department in coöperation with the U. S. Weather Bureau.

Mean Daily Elevation of Water-surface (U. S. Weather Bureau Datum) of West Canada Creek above Morgan Dam at Trenton Falls, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	753.33	753.93	754.18	753.83	755.53	753.53	753.13	753.13	752.93	753.08	753.23	753.58
2	753.33	753.63	754.13	754.03	755.73	753.43	753.13	753.13	752.93	753.28	753.23	753.43
3	753.33	753.58	754.08	754.18	755.63	753.43	753.18	753.13	752.93	753.33	753.23	753.43
4	753.43	753.48	753.93	754.38	755.03	753.33	753.43	753.13	752.93	753.28	753.33	753.43
5	753.53	753.43	753.83	754.58	754.98	753.63	753.43	753.13	752.93	753.08	753.33	753.43
6	755.03	753.78	753.83	754.78	755.38	754.43	753.33	753.13	753.43	753.03	753.33	753.33
7	755.28	754.73	753.83	756.03	755.73	754.08	753.33	753.13	753.33	753.03	753.33	753.23
8	754.88	754.68	753.73	756.98	755.88	753.83	753.28	753.03	753.18	753.03	753.33	753.33
9	754.63	754.58	753.63	756.03	755.78	753.53	753.23	753.03	753.03	752.98	753.33	753.23
10	754.38	754.43	753.68	755.78	755.98	753.53	753.23	752.93	753.03	753.03	753.33	753.23
11	754.08	754.33	753.93	755.03	756.68	754.03	753.23	752.93	752.98	753.03	753.33	753.23
12	754.03	754.33	753.98	754.68	755.83	753.88	753.28	752.93	752.93	752.93	753.33	753.23
13	753.68	754.23	753.88	755.08	755.58	753.88	753.18	752.93	752.93	752.93	753.33	753.23
14	753.68	754.13	753.83	757.18	754.78	753.83	753.13	752.93	752.93	752.93	753.33	753.23
15	753.73	753.93	753.73	757.33	754.58	753.73	753.13	752.93	752.93	752.93	753.33	753.28
16	753.63	753.93	753.73	756.43	754.48	753.58	753.13	753.08	752.93	752.93	753.23	753.33
17	753.63	754.18	753.58	756.18	754.63	753.53	753.13	753.18	752.93	753.08	753.28	753.33
18	753.53	754.28	753.53	756.23	754.38	753.78	753.13	753.33	752.93	753.53	753.83	753.23
19	753.53	754.23	753.48	756.33	754.28	753.83	753.18	753.18	752.93	753.48	753.68	753.33
20	753.53	754.83	753.53	756.98	754.08	753.68	753.13	753.03	752.93	753.28	753.58	753.33
21	753.53	755.88	753.48	756.23	753.93	753.53	753.13	753.03	752.93	733.13	753.53	753.33
22	753.58	755.63	753.43	755.93	753.88	753.53	753.13	753.03	752.93	753.78	753.83	753.33
23	753.53	755.18	753.33	756.23	754.03	753.53	753.13	753.03	752.93	754.33	754.43	753.23
24	754.08	755.13	753.38	755.53	753.83	753.53	753.58	753.03	752.93	754.08	754.28	753.23
25	755.58	755.98	753.68	755.78	753.73	753.43	753.98	752.98	752.93	753.78	753.98	753.23
26	755.43	755.58	754.13	754.98	753.63	753.43	753.78	752.93	752.93	753.53	753.83	753.23
27	754.83	755.23	753.98	755.83	753.48	753.38	753.48	752.93	752.93	753.53	753.73	753.23
28	754.53	754.58	753.73	755.78	753.83	753.33	753.23	752.93	752.93	753.38	753.58	753.23
29	754.43	......	753.78	755.73	753.78	753.23	753.13	752.93	752.93	753.33	753.78	753.23
30	754.43	......	753.83	755.23	753.73	753.23	753.13	752.93	753.03	753.33	753.73	753.23
31	754.28	......	753.83	......	753.73	......	753.13	752.93	......	753.33	......	753.23

WEST CANADA CREEK AT TRENTON FALLS, N. Y.

This gaging station, which is located at the dam of the Utica Gas and Electric Co., was established October 17, 1905, by C. A. Poole. The gage board is secured to face of dam in a vertical position and is placed above the water-surface, the readings being taken by means of chain and plumb-bob passing on pulley over top of gage. The observations are taken by placing plumb-bob at water-surface and reading the gage at a point marked on chain ten feet above plumb-bob. The elevation of zero of gage is 1,009.56, to which all readings are added. The gage is graduated in feet and inches and is read twice each day by C. W. Young.

The dam is of concrete with masonry coping and has a spillway 97.9 feet long. Another spillway or by-pass two feet lower than crest or main spillway allows the water to pass through a rock channel on east side of dam. The crest of this lower spillway is 163.4 feet long at an elevation of 1,007.12. The discharge over the two spillways has been calculated by means of the weir formula, using coëfficients derived from the United States Geological Survey experiments.

The discharge diverted by the Power Company has been computed from diagrams expressing the flow as a function of the kilowatts used. These diagrams were made from tests made by the Power Company to determine the discharging capacity of the turbines, which are of a special design. These tests were made by computing the discharge over weirs placed in the tail-race.

A daily record is kept of the total kilowatts used in twenty-four hours, also the number of hours every day each turbine runs, there being four turbines in all.

The mean discharge has been calculated from each observation taken at the gage, thereby giving a mean for twelve hours, and the maximum and minimum discharges given in the accompanying table are, therefore, means for twelve hours and do not represent the highest or lowest flow of short duration.

The pondage above the Trenton Falls dam is very limited and the operation of the generators during low water has to be adjusted according to the conditions of inflow. The inflow is controlled by pondage above Hinckley dam. Owing to irregularity of operation during low water, the Trenton Falls record is considered approximate only, for the low-water period.

Owing to the drawing down of the pond above the Trenton Falls dam, the average elevation of the water-surface in the pond is deduced from two daily readings, roughly approximate only. The pond level fluctuates often as much as 10 feet during 24 hours in the low-water season. In connection with the calculated discharge at Trenton Falls it may be stated that there are a variety of conditions which tend to make the results of calculations of discharge for that station somewhat too small, especially during low-water periods.

The drainage area at the point of gaging is 375.8 square miles.

Mean Daily Elevation of Water-surface (U. S. Weather Bureau Datum) of West Canada Creek above Power Co.'s Dam, Trenton Falls, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1....	1,017.73	1,019.48	1,019.89	1,019.60	1,020.14	1,017.64	1,013.06	1,016.60	993.48	1,005.86	1,019.14	1,019.48
2....	1,017.68	1,019.31	1,019.81	1,019.68	1,020.64	1,017.44	1,007.10	1,010.06	995.76	1,017.18	1,017.89	1,019.39
3....	1,017.73	1,019.18	1,019.68	1,019.94	1,020.18	1,017.23	1,014.69	1,002.77	996.48	1,019.64	1,015.60	1,019.44
4....	1,017.35	1,018.94	1,019.64	1,020.64	1,019.60	1,017.14	1,017.89	1,005.56	996.39	1,017.06	1,018.64	1,019.39
5....	1,017.64	1,018.94	1,019.48	1,020.27	1,019.64	1,017.85	1,017.69	1,001.81	1,010.73	1,005.98	1,019.18	1,019.56
6....	1,019.52	1,019.56	1,019.48	1,020.56	1,020.14	1,018.85	1,014.94	994.68	1,019.52	1,007.94	1,019.18	1,019.23
7....	1,020.02	1,020.68	1,019.64	1,021.81	1,020.31	1,018.27	1,010.52	1,000.14	1,016.68	1,008.81	1,019.39	1,018.02
8....	1,019.39	1,020.56	1,019.27	1,022.35	1,020.68	1,017.98	1,008.14	1,013.64	1,001.35	1,006.77	1,019.06	1,018.89
9....	1,019.23	1,020.18	1,019.18	1,021.06	1,020.44	1,017.77	1,009.06	1,011.06	1,005.73	1,008.44	1,019.27	1,008.35
10....	1,019.23	1,020.06	1,019.31	1,020.10	1,020.60	1,017.77	1,016.18	994.10	1,000.60	994.35	1,019.27	1,008.39
11....	1,018.48	1,019.98	1,019.73	1,020.52	1,021.56	1,018.31	1,018.18	991.02	996.85	1,006.90	1,019.27	1,014.89
12....	1,018.14	1,019.98	1,019.77	1,018.94	1,020.89	1,018.27	1,009.77	1,000.60	1,011.35	1,003.89	1,019.02	1,019.64
13....	1,018.27	1,019.89	1,019.68	1,019.64	1,019.89	1,018.23	1,006.60	987.85	1,012.81	998.94	1,019.14	1,018.81
14....	1,019.18	1,019.85	1,019.81	1,022.73	1,019.31	1,018.10	1,003.98	990.81	1,007.52	1,006.06	1,019.73	1,013.39
15....	1,019.44	1,019.60	1,019.48	1,022.60	1,019.18	1,017.98	1,004.60	995.39	997.35	1,001.90	1,018.48	1,015.77
16....	1,019.23	1,019.73	1,019.44	1,021.39	1,019.60	1,017.77	1,003.35	993.89	993.64	998.40	1,011.46	1,019.06
17....	1,019.77	1,020.27	1,019.31	1,020.89	1,019.23	1,017.60	1,001.48	1,010.19	995.68	1,013.06	1,014.68	1,018.60
18....	1,017.98	1,020.18	1,019.23	1,021.14	1,018.98	1,018.10	1,009.02	1,019.35	995.10	1,019.56	1,019.77	1,018.14
19....	1,018.44	1,020.02	1,018.89	1,021.14	1,018.64	1,018.23	1,008.56	1,019.06	1,001.39	1,019.39	1,019.52	1,019.56
20....	1,018.39	1,020.56	1,019.23	1,022.14	1,018.39	1,018.23	1,007.60	1,014.02	1,005.98	1,018.31	1,019.44	1,018.27
21....	1,018.35	1,021.85	1,019.48	1,021.02	1,018.14	1,017.77	1,005.31	1,011.27	999.85	1,016.90	1,019.64	1,018.56
22....	1,018.60	1,021.31	1,018.85	1,020.56	1,018.14	1,017.56	1,006.85	1,019.27	996.14	1,019.64	1,019.68	1,017.68
23....	1,018.89	1,020.81	1,018.35	1,021.06	1,018.27	1,017.35	1,007.10	1,011.77	995.68	1,020.10	1,020.35	1,017.48
24....	1,020.10	1,020.64	1,018.64	1,020.31	1,017.94	1,017.23	1,017.64	992.18	998.48	1,020.06	1,020.35	1,015.52
25....	1,021.18	1,021.02	1,019.44	1,020.52	1,017.77	1,016.44	1,018.18	991.77	1,000.31	1,019.68	1,020.14	1,018.23
26....	1,021.06	1,021.39	1,019.81	1,019.73	1,017.64	1,017.31	1,017.85	991.31	*a*	1,019.52	1,019.81	1,019.64
27....	1,020.89	1,020.89	1,019.64	1,020.48	1,017.56	1,017.73	1,017.27	996.48	1,009.48	1,019.44	1,019.64	1,017.27
28....	1,020.10	1,020.48	1,019.98	1,020.44	1,018.27	1,015.39	1,013.27	1,001.27	1,002.56	1,019.27	1,019.73	1,016.27
29....	1,019.81	....	1,019.60	1,020.35	1,018.18	1,009.18	1,011.39	1,002.64	1,004.10	1,018.06	1,019.60	1,016.44
30....	1,019.81	....	1,019.56	1,019.81	1,018.23	1,010.52	1,009.73	994.85	1,011.31	1,018.35	1,019.60	1,018.10
31....	1,019.89	....	1,019.52	....	1,018.06	....	1,009.18	997.35	....	1,019.60	....	1,016.14

a No record.

WEST CANADA CREEK AT TWIN ROCK BRIDGE, NEAR GRANT, N. Y.

A current-meter gaging station was established at Twin Rock bridge, September 7, 1900, by Robert E. Horton, for the U. S. Geological Survey, by which it has since been maintained in coöperation with this Department. The bridge is 167.5 feet long between abutments, and consists of two spans. The bed is of gravel and cobble, and the entire flow passes underneath at all stages. In the winter the stream becomes completely ice-covered, requiring special discharge measurements. The gage is read each morning and evening by Frank McArthur, and the record is furnished by the Consolidated Water Co. of Utica, N. Y.

The readings are taken from a gage of special design equipped with a phosphor-bronze tape, attached to the up-stream side of the bridge. When the stream is obstructed by logs, the discharge is determined from special measurements. During 1909 a series of low-water measurements was made by boat at a cross-section up-stream from the bridge.

The gaging section at Twin Rock bridge is affected at times by backwater from logs which are lodged in the stream, beginning near Hinckley mill-dam and extending up-stream nearly to the bridge, or sometimes above the bridge. During periods of log obstruction, as also in winter, when the stream is ice-covered and contains more or less needle ice, it is necessary to estimate the discharge from special current-meter measurements and rating curves. The accompanying tables show the actual readings of the gage, but owing to the complicated conditions it is not practical to publish rating tables. It is to be understood that there is not a uniform or constant relation between the gage height and discharge.

The drainage area at point of gaging is 364 square miles.

Mean Daily Gage Height, in Feet, of West Canada Creek at Twin Rock Bridge near Grant, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	29.34	31.24	32.77	30.77	34.76	31.05	30.18	30.18	29.80	30.40	30.61	30.08
2	29.32	31.14	32.41	30.94	36.00	30.82	30.09	30.15	29.88	30.71	30.54	30.06
3	29.48	30.96	32.06	31.35	34.74	30.74	30.39	29.96	29.86	30.56	30.68	30.08
4	29.30	30.79	31.88	31.96	34.10	30.68	31.02	29.92	29.78	30.40	30.77	29.90
5	29.54	30.80	31.51	31.79	33.82	31.66	30.66	29.88	30.76	30.20	30.78	29.86
6	33.19	31.51	31.36	32.34	34.96	33.32	30.40	29.86	30.88	30.06	30.67	29.71
7	33.80	33.68	31.28	36.20	35.89	32.28	30.23	29.86	30.44	29.96	30.53	29.48
8	33.28	34.04	31.10	37.85	36.54	31.74	30.12	29.94	30.22	30.60	30.57	29.75
9	33.04	33.48	30.96	34.99	35.78	31.38	30.06	29.78	30.04	30.16	30.82	29.95
10	33.29	33.02	31.28	32.97	36.40	31.36	30.01	29.66	29.92	29.90	30.92	29.34
11	32.96	33.12	32.12	32.08	38.56	32.48	30.46	29.62	29.88	29.86	30.80	29.78
12	32.68	33.12	32.18	30.90	35.92	32.22	29.95	29.58	29.98	29.98	30.68	29.82
13	31.76	32.89	31.86	32.22	36.26	31.72	29.92	29.54	29.90	30.10	30.60	29.56
14	31.82	32.40	31.58	37.88	34.11	33.02	29.84	29.59	29.82	30.14	30.50	29.72
15	32.11	32.32	31.38	38.08	33.95	31.75	29.86	29.58	29.91	30.06	30.43	29.75
16	31.66	32.67	31.12	36.00	33.82	31.42	29.99	30.28	29.81	30.02	30.38	29.84
17	31.38	33.99	31.02	35.15	33.80	31.16	30.00	30.85	29.82	30.76	30.82	29.78
18	31.44	33.94	30.86	35.58	33.49	32.10	30.08	30.86	29.72	31.22	31.63	29.76
19	31.40	33.52	30.70	35.70	33.08	32.22	30.16	30.67	29.68	30.88	31.28	29.86
20	31.40	35.20	30.78	37.70	32.46	31.86	30.20	30.36	29.70	30.53	31.09	29.79
21	31.42	37.80	30.50	35.91	32.12	31.50	30.17	30.43	29.72	30.48	31.02	29.71
22	31.32	36.46	30.60	34.88	32.32	31.07	30.01	30.31	29.92	31.70	31.76	29.62
23	31.46	35.04	30.46	36.10	32.44	30.83	30.22	30.02	29.59	32.48	32.22	29.54
24	32.46	34.48	30.48	34.50	31.66	30.73	31.00	29.88	30.00	32.03	32.10	29.56
25	36.26	37.08	30.89	34.84	31.44	30.64	*a*	29.78	30.16	31.56	32.94	29.74
26	37.50	36.26	31.75	33.90	31.00	30.64	*a*	29.75	30.02	31.18	31.44	29.82
27	34.00	35.12	31.54	35.54	31.12	30.59	30.66	29.78	29.90	30.96	30.64	29.63
28	33.28	33.74	31.12	35.34	32.15	30.40	30.45	29.64	29.88	30.80	30.27	29.51
29	32.40	......	31.12	34.52	31.95	30.30	30.63	29.74	30.18	30.69	30.52	29.42
30	32.28	......	30.97	34.25	31.68	30.25	30.32	29.83	30.21	30.56	30.70	29.34
31	31.50	......	30.72	......	31.49	......	30.24	29.75	......	30.81	......	29.37

a No record.

Current-meter Discharge Measurements of West Canada Creek at Twin Rock Bridge near Grant, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.	Remarks.
		Feet.	*Square feet.*	*Ft. per second.*	*Second-feet.*	
1909.						
Jan. 21	Newton and Niles. .	*a*31.41	......	......	366	Ice measurement.
Feb. 12	Gehring and Clark. .	*a*33.18	......	......	1,124	Ice measurement.
Mar. 2	Gehring and Patchke	*a*32.34	......	......	948	Ice measurement.
April 19	Clark and Niles.....	35.47	1,431	4.19	5,999	At bridge.
May 4	Niles and Patchke. .	34.12	1,060	2.29	2,423	At bridge.
May 4	Niles and Patchke. .	34.40	1,262	2.22	2,807	At bridge.
May 25	Clark and Angus. . .	31.48	786	0.686	539	At bridge.
July 9	Gehring and Clark. .	30.10	910	0.210	191	Boat section, about 1,000 feet above bridge.
July 14	J. P. Newton.......	29.96	849	0.214	182	Boat section, about 1,000 feet above bridge.
Aug. 23	Clark and Niles.....	30.04	888	0.259	230	Boat section, about 1,000 feet above bridge.
Sept. 8	Clark and Robbins..	30.25	931	0.251	234	Boat section, about 1,000 feet above bridge.
Sept. 15	E. C. Niles.........	30.03	894	0.233	208	Boat section, about 1,000 feet above bridge.
Sept. 27	Gehring and Clark. .	29.87	882	0.159	140	Boat section, about 1,000 feet above bridge.

a Gage read to water-surface.

Mean Daily Discharge, Second-feet, of West Canada Creek at Twin Rock Bridge near Grant N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	330	240	1,195	1,165	3,320	395	225	225	170	265	305	210
2	325	198	1,042	1,375	5,118	350	212	221	182	325	290	208
3	355	126	904	1,890	3,290	332	262	195	180	295	320	210
4	322	*a*194	860	2,700	2,390	318	392	188	170	265	335	185
5	370	*a*262	721	2,490	2,048	600	315	182	336	230	340	180
6	4,370	330	693	3,205	3,615	1,555	265	180	365	205	315	160
7	5,220	1,460	683	5,400	4,960	860	232	180	272	190	290	140
8	4,500	1,610	645	7,665	5,880	625	218	190	231	300	298	165
9	2,172	1,325	617	3,670	4,800	505	210	170	205	220	350	190
10	2,243	1,054	761	1,275	5,680	498	200	157	190	185	375	138
11	1,954	1,110	1,174	768	8,630	965	275	152	182	180	345	170
12	1,701	1,096	1,236	370	5,000	833	192	148	195	195	320	172
13	1,109	985	1,114	835	5,485	618	190	145	185	210	300	145
14	1,070	753	1,006	7,700	2,400	740	178	149	173	220	280	160
15	1,148	733	948	7,920	2,200	630	180	148	187	205	270	165
16	842	925	860	5,118	2,045	515	198	241	171	198	260	175
17	636	1,688	849	3,890	2,025	435	199	357	173	335	350	170
18	597	1,671	805	4,510	1,710	775	210	360	162	455	590	168
19	502	1,430	761	4,768	1,355	833	222	318	158	365	475	180
20	431	2,524	827	7,540	955	670	230	255	160	290	420	170
21	371	4,475	750	4,985	785	540	223	268	161	280	398	160
22	323	3,448	805	3,498	880	415	200	248	188	610	635	150
23	382	2,456	772	5,340	945	350	231	202	150	965	830	142
24	858	2,104	806	2,942	600	330	390	182	198	745	775	145
25	3,340	3,957	1,018	3,435	525	310	*b*365	170	220	560	1,255	162
26	2,900	3,349	2,425	2,138	395	310	*b*340	168	200	442	520	175
27	1,740	2,567	2,145	4,475	425	300	315	170	185	380	310	152
28	1,290	1,710	1,570	4,155	800	265	272	155	180	345	240	141
29	801	......	1,570	2,970	710	245	255	163	225	320	285	140
30	736	......	1,400	2,585	605	238	250	175	230	295	320	138
31	518	......	1,110	......	539	......	235	168	......	350	......	139
Mean	1,402	1,564	1,035	3,692	2,584	545	248	201	199	336	413	165

a Probable needle ice obstruction; flow interpolated.
b Flow interpolated.

Monthly Discharge of West Canada Creek at Twin Rock Bridge near Grant, N. Y.
[Drainage area, 364 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	5,220	322	1,402	3.85	4.43
February	4,475	126	1,564	4.30	4.47
March	2,425	617	1,035	2.84	3.27
April	7,920	370	3,692	10.14	11.36
May	8,630	395	2,584	7.10	8.16
June	1,555	238	545	1.50	1.68
July	392	178	248	0.681	0.783
August	360	145	201	0.552	0.635
September	365	150	199	0.547	0.613
October	965	180	336	0.923	1.06
November	1,255	240	413	1.13	1.27
December	210	138	165	0.453	0.521

PRECIPITATION IN UPPER WEST CANADA CREEK DRAINAGE BASIN.

Rain gages and records of snowfall at Hoffmeister and North lake have been continued as in preceding years. The results for the year 1909 are given in the accompanying table.

A rain gage was erected at the residence of Frank McArthur about one-half mile south of Twin Rock bridge, near Grant, on April 15, 1909. This is a standard U. S. Weather Bureau pattern rain gage, set under favorable conditions with free exposure, but protected from severe winds, the mouth of the gage being about 4 feet above the ground. This gage is at altitude approximately 1,250 feet above tide. The data for 1909 is given in the accompanying table.

The rain gage at Trenton Falls, described in the report for 1908, has been continued in service, but its location was changed in November, 1909, to a meadow lot about 200 feet north from the residence of C. W. Young. The gage formerly stood about 100 feet south from this residence, but a change in location was necessary on account of the construction of buildings adjacent to the gage.

A rain gage was established by the Consolidated Water Company of Utica, N. Y., at the reservoir on Black creek, at Gray, in August, 1908. This is also a standard Weather Bureau pattern gage, set in favorable condition as to exposure with mouth of gage about 4½ feet above ground. The observations taken at this station are furnished to this Department for publication, but are not at present available for the year 1909.

Daily Precipitation, in Inches, near Hoffmeister, N. Y.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	T*		T*		0.63*				0.08	0.21		
2	T*	0.06*		0.14		T	0.78				T R	
3	T*			T*	0.42							
4	0.90		0.77*			1.52			0.99		0.45	
5								T			T*	
6	T*	0.50		0.14	0.40							
7			0.26*	0.57*								1.10*
8											0.36	
9	T*		0.29	T*	0.27					0.15		
10	T*	1.02*	0.32*		1.25	0.91	0.04		0.24			
11	T				T	T	T			0.49		
12	0.89*											
13		0.08	0.10*	0.80	0.25	0.44						1.86*
14	0.26*	2.50	T*	0.78	T	0.01	0.30			0.10		
15					0.35			1.63		T*	T	
16		0.68*	0.40*				0.07		0.21	0.92*	0.63	
17	2.17*			0.35	0.15	1.10		0.50		T*	T*	
18				0.02	T		0.46			T*	T*	T*
19	T*	1.17	0.15	0.17	0.14		0.09	T				
20		T*						0.07				0.19*
21	T			0.38						1.27	1.25	
22			T*			0.14						0.27*
23	0.72	1.88		0.17	T	0.01	2.09		0.77	0.12	T*	
24	0.45*				T					T*	0.74*R	
25			2.32*	0.32		T						T*
26								T				0.15*
27	T*	0.09*		0.56	0.49				0.54			
28		T*	T*	T*	0.27					T*	0.10	T*
29			T*	T*	T		0.44	0.10		T*		0.05*
30	0.21*		T*	0.65					0.62			
31							T	0.50				

* Snow. T means trace. R means rain.

Daily Precipitation, in Inches, at North Lake, near Atwell, N. Y.

DAY.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.									
1		0.80				0.56	0.56		*0.50
2		0.20							
3	0.15	0.30		1.07			0.35		
4			0.16			0.45		0.25	
5			0.93						
6		0.40				0.60			
7	0.28	0.25							
8									
9	0.30	0.25							*0.20
10		1.00	0.60					0.10	*0.10
11		0.30		0.16					
12							0.48		
13			0.34						*0.13
14	0.71								
15	0.27								*0.15
16		0.62		0.66	0.44	0.33			
17	0.61	0.15	0.87	0.28					*0.15
18	0.06	0.17	0.43		0.40				*0.18
19	0.07		0.12	0.47				*0.50	
20									
21							1.00		
22	0.42								
23				0.85		0.72			
24			0.26	0.75					
25				0.25				0.50	*0.18
26	0.15								
27		0.15							
28	1.00	0.60							*0.20
29					0.44				*0.21
30								*0.40	
31									2.00

Record missing for January, February and March. * Snow.

Daily Precipitation, in Inches, at Twin Rock Bridge, near Grant, N. Y.

DAY.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.									
1		0.23				0.28	0.76		
2		0.85					0.12		
3		0.13		0.63			0.02	0.24	
4		0.13		0.11				0.10	
5			1.33			1.12		0.02	
6			0.56			0.05			
7		0.15							
8									0.37
9								0.31	
10									*0.07
11		1.02	0.62			0.20			*0.03
12				0.07			0.32		
13									*0.07
14			0.38						0.56
15				0.07					*0.15
16		0.36			1.23	0.36			*0.09
17	0.13	0.50			0.36		1.20	0.85	*0.07
18	0.11	0.50	0.43	0.08	0.25		0.15	*0.03	*0.07
19	0.07		0.30	0.39	0.02		0.18		*0.12
20	0.10							0.02	
21					0.18				
22	0.33						0.60	0.15	
23				0.32			0.12	0.42	
24				1.39		0.94	0.10		
25				0.22				*0.71	
26	0.17								*0.19
27					0.10				
28	0.60	0.44				0.34	0.01		
29		0.20						0.10	*0.08
30	0.39				0.15				
31									

* Snow.

WEST CANADA CREEK AT WILMURT, N. Y.

A gaging station was established at the highway bridge crossing West Canada creek at Wilmurt, on June 28, 1909, by this Department. The gage consists of an enameled steel scale, reading in feet and tenths from zero to 10 feet. This is attached to planking on the right-hand side of the center pier on the downstream side of the bridge. In addition a 5-foot section, reading from 10 feet to 15 feet, is attached to a telegraph pole near the Flansburgh residence. The cross-section of the stream at the location of the gage is not favorable for purposes of measurement in low water. It can be utilized at certain stages of the stream and low-water measurements can be obtained at a more favorable cross-section located a short distance down-stream. The observer is Glenn W. Flansburgh, by whom gage readings are taken at 7 A. M. and 4 P. M. each day. This gaging station can be reached only by driving a distance of several miles from Prospect or Hinckley. The drainage area at the gaging station is 224 square miles. The gage is located above the limit of backwater from the proposed Hinckley reservoir.

Mean Daily Gage Height, in Feet, of West Canada Creek at Wilmurt, N. Y.

DAY.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.						
1	2.15	2.10	2.00	2.45	2.30	3.00
2	2.10	2.10	2.00	2.35	2.25	2.90
3	2.45	2.10	2.00	2.30	2.25	2.75
4	2.50	2.10	2.05	2.25	2.35	2.55
5	2.35	2.10	2.70	2.20	2.45	2.45
6	2.25	2.10	2.40	2.10	2.50	2.50
7	2.20	2.10	2.20	2.15	2.50	2.50
8	2.20	2.00	2.15	2.50	2.50	2.55
9	2.10	2.00	2.10	2.20	2.50	2.60
10	2.10	2.00	2.15	2.10	2.50	2.60
11	2.10	2.00	2.15	2.10	2.50	2.70
12	2.10	2.00	2.10	2.10	2.50	2.70
13	2.10	2.00	2.10	2.20	2.50	2.70
14	2.05	1.90	2.10	2.20	2.45	2.60
15	2.00	1.90	2.00	2.10	2.40	2.65
16	2.05	2.10	2.00	2.10	2.75	2.70
17	2.10	2.50	2.05	2.15	2.95	2.70
18	2.15	2.40	2.00	2.55	3.05	2.70
19	2.20	2.35	2.00	2.60	3.35	2.70
20	2.20	2.30	2.00	2.45	3.50	2.70
21	2.15	2.20	2.15	2.30	3.80	2.60
22	2.10	2.15	2.10	3.25	3.95	2.65
23	2.20	2.10	2.20	3.55	4.05	2.70
24	2.85	2.05	2.15	3.45	4.15	2.80
25	2.85	2.00	2.10	3.25	3.50	2.75
26	2.65	2.00	2.00	3.15	3.05	2.65
27	2.45	2.00	2.05	2.95	2.90	2.60
28	2.35	1.95	2.80	2.50	2.85	2.75
29	2.30	2.05	2.70	2.45	3.05	2.80
30	2.25	2.15	2.25	2.40	3.05	3.00
31	2.20	2.10	......	2.30	......	2.95

Current-meter Discharge Measurements of West Canada Creek at Wilmurt, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Dis-charge.	Remarks.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*	
July 8	Gehring and Clark......	2.18	201	.349	70.1	Section below bridge.
July 26	Niles and Angus........	2.50	242	.785	190	Section below bridge.
Aug. 24	Clark and Niles.........	2.10	267	.279	74.6	Section above bridge.
Sept. 8	Clark and Robbins......	2.15	187	.583	109	Bridge section.

MOHAWK RIVER AT UTICA, N. Y.

A current-meter gaging station was formerly maintained at the Genesee street bridge in Utica, by Robert E. Horton, hydrographer, U. S. Geological Survey, but was discontinued May 1, 1903, owing to changes in the channel, due to the river straightening work begun by the city of Utica. A description of the drainage area of the Mohawk river above Utica, and a record of the discharge for several months at this station are given in the Supplement to the Report of the State Engineer and Surveyor for 1903.

Prior to December, 1908, the gaging station was located at the bridge on the Black River branch of the N. Y. C. & H. R. R. R., crossing the river about three-quarters of a mile west of Genesee street. It was established March 31, 1905, by C. A. Poole, in coöperation with the U. S. Weather Bureau. The gage is a vertical board, graduated in feet and tenths, and is secured to the southeast wing of the south abutment of the bridge, with its zero mark at elevation 394.81. Observations of the stage of the stream are taken twice each day by Willard E. Young.

This station was established originally for the purpose of obtaining a record of the fluctuation of the water-surface in that vicinity, and has been maintained for that purpose principally. Several current-meter measurements, however, have been made, from which the discharge has been calculated for the different stages of the river at the time of measurement. The location is not favorable, however, for meter measurements, the flow of the stream being sluggish, especially during low water, and the adjacent flats are overflowed during flood stages. On December 4, 1908, the gage was removed to the right-hand abutment of the U. & M. V. R. R. bridge crossing the new Mohawk river channel, at North Genesee street, Utica. The datum of the gage is now 393.14.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Utica, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	397.04	398.59	403.44	403.79	400.24	397.04	395.94	396.29	395.74	396.04	395.99	396.64
2	397.14	399.09	402.74	403.89	400.39	396.94	395.94	396.19	395.74	396.14	395.89	396.54
3	397.14	399.14	402.04	404.09	400.19	396.89	396.09	396.14	395.84	3 6.09	395.84	396.54
4	397.24	400.44	401.34	404.04	399.94	396.89	396.39	396.04	395.94	395.94	395.74	396.49
5	397.54	401.24	400.39	404.14	399.34	398.49	396.34	395.94	396.09	395.94	395.74	396.54
6	397.89	402.09	399.44	404.29	398.84	399.39	396.24	395.84	396.14	395.89	395.64	396.44
7	397.94	402.14	398.39	404.74	398.59	399.39	396.14	395.74	396.04	395.84	395.64	396.49
8	398.04	401.39	398.14	405.14	398.49	398.94	395.99	395.59	396.04	395.79	395.74	396.64
9	398.19	400.39	398.29	404.99	398.24	398.29	395.94	395.54	395.94	395.74	395.94	396.74
10	398.19	399.39	398.54	404.34	397.94	398.04	395.84	395.44	395.94	395.64	395.94	396.84
11	398 44	398 59	398.44	404.74	397.94	398.59	395.69	395.44	396.04	395.64	395.84	396.94
12	398.99	398.14	398.34	405.74	398.19	397.64	395.64	395.34	396.09	395.94	395.84	396.89
13	399.44	398.09	398.19	405.69	398.34	397.04	395.54	395.34	396.14	396.14	395.84	396.81
14	399.54	398.04	398.04	404.84	398.49	397.09	395.54	395.34	396.04	396.14	395.74	396.94
15	399.29	397.94	397.94	404.39	398 94	397.14	395.44	395.34	395.94	395.99	395.74	396.94
16	398.49	398.29	397.94	403.59	399.19	396.89	395.44	396.09	395.94	395.99	395.74	397.04
17	397.14	399.04	398.04	402.39	399.39	396.79	395.49	376.99	395.94	396.39	395.84	397.04
18	397.34	399.84	398.04	401.24	399.29	397.64	395.64	397.14	395.94	396.44	395.84	397.04
19	397.99	401.29	398.09	401.04	399.09	397.24	359.64	396.84	395.94	396.59	395.94	397.14
20	398.24	402.34	398.14	400.64	398.39	399.99	395.64	396.39	395.84	396.64	395.94	397.04
21	399.39	403.69	398.24	400.04	397.59	396.79	395.54	396.09	395.84	396.64	395.99	397.04
22	400.14	404.44	398.44	399.64	397.04	396.59	395.49	395.94	395.84	396.74	396.04	396.94
23	401.74	404.84	399.04	399.19	396.64	396.49	396.29	395.94	395.79	396.84	396.14	396.94
24	402.54	405.14	400.64	398.94	396.49	396.39	397.84	395.84	395.89	396.84	396.14	397.04
25	402.19	405.14	403.64	398.59	396.39	396.29	397.94	395.84	396.04	396.84	396.19	397.14
26	402.09	404.84	404.14	398.44	396.34	396.24	397.44	395.84	395.94	396.74	396.34	397.14
27	401.44	404.44	403.99	398.29	396.34	396.14	397.09	395.84	395.94	396.64	396.54	397.04
28	401.14	404.09	403.94	398.14	396.64	396.14	396.79	395.79	395.84	396.59	396.44	396.99
29	400.39	......	403.74	398.29	399.99	396.04	396.64	395.79	395.94	396.39	396.44	396.94
30	399.49	......	403.89	398.49	397.19	395.09	396.64	395.84	395.94	396.14	396.54	396.84
31	398.34	......	403.54	......	397.09	......	396.39	395.74	......	396.09	......	396.74

Daily Precipitation, in Inches, at Utica, N. Y.

DAY.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov	Dec
1909.											
1	......	......	......	0.10	......	......	......	0.06	0.10	..	......
2	......	0.07	......	1.00	......	......	......	......	0.10	......	......
3	......	......	0.10	0.20	......	0.56	......	......	0.02	......	......
4	......	0.01	......	......	......	......	......	......	......	......	......
5	......	0.05	......	0.10	0.40	......	......	0.42	......	......	0.02
6	......	0.05	......	......	1.02	......	......	......	......	......	......
7	......	......	0.35	0.31	......	......	0.03	......	......	......	0.06
8	......	0.06	......	......	......	......	......	......	......	0.06	0.20
9	......	......	0.08	......	......	......	......	......	......	0.56	0.07
10	......	0.47	0.40	0.22	T	......	0.02	T	......	......	0.12
11	......	0.08	......	0.76	0.66	......	......	0.42	......	......	......
12	......	0.09	......	......	......	0.04	......	......	0.52	......	......
13	......	......	......	......	......	......	......	......	......	......	0.07
14	0.05	0.03	0.90	0.10	0.30	......	......	......	......	......	0.24
15	1.40	......	0.47	0.82	......	......	......	......	0.02	......	0.10
16	1.45	......	......	0.09	......	0.07	2.03	0.12	......	......	......
17	1.05	0.05	......	0.28	......	0.29	0.42	......	0.75	0.25	0.20
18	......	0.31	......	0.13	0.70	......	0.22	......	......	0.08	0.15
19	......	......	0.04	......	......	0.15	0.20	......	0.37	......	0.15
20	0.90	0.05	0.20	......	......	0.10	......	......	......	......	......
21	......	......	......	......	......	......	......	......	......	......	......
22	......	......	0.08	......	......	......	......	......	0.52	0.12	0.05
23	0.10	......	......	......	......	0.31	......	......	0.20	0.30	0.30
24	1.00	......	......	......	......	1.00	......	0.65	0.21	......	0.05
25	......	0.30	......	......	......	0.29	......	......	0.05	0.56	......
26	......	1.36	......	......	0.05	......	......	......	0.30	0.20	0.20
27	0.04	0.14	......	......	......	......	0.37	......	......	......	0.10
28	......	0.08	......	0.53	0.30	......	......	0.48	......	......	0.02
29	......	......	......	0.16	......	......	......	......	......	......	0.04
30	......	......	0.70	......	......	0.22	0.31	......	......	......	......
31	......	......	......	......	......	......	......	......	......	......	......

T means trace.

PRECIPITATION AT SAVAGE RESERVOIR NEAR UTICA, N. Y.

A standard U. S. Weather Bureau pattern rain gage is located at Savage reservoir on the south slope of Mohawk valley about 3 miles southeast of Utica. The gage rim stands 4 feet above ground and is at elevation about 700 feet above tide. The record is furnished by the Consolidated Water Co. of Utica, N. Y.

Data for 1909 is not at present available.

PRECIPITATION AT DEERFIELD RESERVOIR.

A standard U. S. Weather Bureau pattern rain gage was established at Deerfield reservoir in 1903. From January 1, 1901, to June, 1903, a rain gage five inches in diameter was used. This station is located on the north slope of Mohawk valley about 4 miles north of Utica and at elevation about 700 feet above tide. The record is furnished by the Consolidated Water Co. of Utica.

Data for 1909 is not at present available.

GRAEFENBURG HYDROPHYSICAL STATION NEAR UTICA, N. Y.

This station is located near Graefenburg reservoir, near Utica, about 4 miles south from the Mohawk river, and at altitude 1,100 feet above tide. This station was established in 1905 by Robert E. Horton for the purpose of determining the relation of rainfall, evaporation and ground water in the typical soils of the Mohawk valley. The station was maintained in coöperation with the U. S. Geological Survey preceding May 1, 1907, when it was turned over to this Department. A detailed description of the station, together with the records preceding 1907, may be found in the State Engineer's Report for 1906, supplement, pages 215–245

The records for 1909 are not yet available for publication.

NINE MILE CREEK AT POWELL'S BRIDGE, NEAR STITTVILLE, N. Y.

A gaging station was established at Powell's bridge, one mile below the village of Stittville, November 4, 1905, by C. A. Poole. Observations of the stage of the stream are taken each morning and afternoon by Mrs. Raymer Powell, from a weight-and-chain gage attached to the bottom chord on the down-stream side of the bridge.

Nine Mile creek drains a large portion of the territory on the north side of the Mohawk river between Utica and Rome, emptying into the latter stream near Oriskany. Its channel will be improved and used as a feeder for the diversion of water from West Canada creek to the summit level of the improved Erie canal, according to present plans. The drainage area above the station is 62.6 square miles.

A gaging station was maintained at this point by the U. S. Deep Waterways Commission during their survey in 1898. At that time there was a dam about 200 feet below the bridge, which has since been destroyed, leaving the flow unimpeded. The channel is of rock, of uniform cross-section and straight for several hundred feet each way from the bridge, and the conditions are very favorable for current-meter discharge measurements, which are made from the up-stream side of the bridge.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Nine Mile Creek near Stittville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	484.67	484.97	484.32	485.04	486.57	484.10	483.30	483.20	483.19	483.52	484.22	484.32
2	484.87	484.27	484.17	486.04	486.52	484.00	483.20	483.10	483.19	483.57	484.37	484.42
3	485.02	484.27	484.07	486.19	485.12	484.00	483.20	483.10	483.89	483.82	484.32	484.47
4	485.67	484.37	484.07	485.79	484.17	484.15	483.10	483.10	484.04	483.92	484.22	484.32
5	486.67	484.62	483.97	485.19	484.17	485.05	483.10	483.20	483.99	483.82	484.22	484.32
6	486.87	486.82	484.07	486.04	484.12	485.00	483.10	483.20	483.99	483.87	484.22	484.22
7	485.87	486.22	483.97	486.14	484.17	484.60	483.00	483.15	482.99	483.92	484.32	484.12
8	484.87	485.52	484.02	486.04	484.22	484.10	483.00	483.10	482.99	484.02	484.42	484.02
9	484.57	485.42	484.17	485.14	485.37	484.10	483.00	483.10	482.99	484.02	482.32	483.97
10	484.57	485.27	484.27	484.79	485.17	484.15	482.90	483.10	482.89	484.02	484.32	483.87
11	484.22	484.57	484.17	484.59	485.12	484.30	483.00	483.10	482.89	484.02	484.17	483.82
12	484.17	484.42	484.27	484.59	485.17	484.40	483.00	483.15	482.94	484.02	484.12	483.82
13	484.32	484.37	484.27	484.69	485.22	484.50	483.90	483.20	482.99	484.12	484.12	484.12
14	485 02	484.32	484.22	484.99	485.12	484.45	484.05	483.20	482.99	484.22	484.07	484.22
15	484.97	484.37	484.17	484.89	485.02	484.15	484.10	483.90	482.99	484.22	484.02	484.22
16	484.97	484.47	484.07	484.59	485.82	484.10	484.10	483.95	482.99	484.32	483.97	484.22
17	484.97	484.62	484.07	484.59	485.22	484.10	484.10	484.10	482.99	484.32	484.07	484.22
18	484.97	484.67	484:12	484.54	485.27	484.05	484.15	484.24	482.99	484.32	484.12	484.22
19	485 07	485.22	484.17	484.44	484.12	484.10	484.15	484.34	482.99	484.27	484.22	484.22
20	485.07	487.82	484.17	484.34	484.02	484.10	484.10	484.44	483.04	484.22	484.22	484.22
21	485 17	485.67	484.17	484.34	484.17	484.05	483.95	484.44	483.09	484.22	484.22	484.22
22	485.27	485.22	484.07	484.29	484.12	484.00	483.50	484.24	483.19	484.12	484.32	484.22
23	485.37	485.57	484.07	484.44	484.12	483.90	484.60	484.14	483.29	484.12	484.37	484.12
24	487.52	487.27	484.17	484.39	484.12	483.90	484.60	484.14	483.39	484.12	484.42	484.12
25	485.52	487.57	484.22	484.39	484.12	483.00	484.00	484.14	483.29	484.07	484.47	484.12
26	485.02	486.07	485.42	484.29	483.62	483.05	483.50	484.14	483.29	484.02	484.52	484.12
27	484.97	484.32	485.52	484.19	484.12	483.10	483.45	483.30	483.32	484.07	484.57	484.12
28	481.97	484.12	485.42	484.49	485.07	483.10	483.40	483.20	483.42	484.02	484.47	484.12
29	484.97	......	485.27	484.64	484.12	483.35	483.30	483.20	483.42	484.02	484.52	484.12
30	484.97	......	485.17	485.44	484.02	483.30	483.30	483.20	483.52	483.92	484.42	484.22
31	484.97	......	485.07	......	483.92	......	483.20	483.20	......	483.92	......	484.22

Current-meter Discharge Measurements of Nine Mile Creek near Stittville, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
Feb. 8....	Gehring and Clark..................	3.0	100	1.45	145
Mar. 3....	Gehring and Patchke................	3.0	98.2	1.63	160
April 7....	E. C. Niles.........................	4.0	180	5.20	936
April 15....	J. P. Newton........................	3.7	156	3.89	607
April 21....	A. T. Clark.........................	2.62	83.5	1.75	146
May 26....	Clark and Angus....................	2.3	51.6	0.595	30.7
June 16....	E. C. Niles.........................	2.2	45.1	0.517	23.3
July 14....	J. P. Newton........................	1.98	24.1	0.212	5.1
Sept. 27....	H. A. Gehring.......................	2.07	35.2	0.224	7.9
Nov. 3....	E. C. Niles.........................	2.13	38.1	0.472	18.0

MOHAWK RIVER BELOW STATE DAM AT ROME, N. Y.

A staff gage with painted tenth-foot marks is attached to the down-stream end of the right-hand abutment of the State feeder dam at Rome. Readings are taken each morning by John Phillips.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River below State Dam at Rome, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1..................	429.06	431.46	429.46	430.26	432.01	428.16	428.06	427.96	427.96	427.96	428.06	429.16
2..................	428.96	431.46	429.46	430.66	431.46	428.06	428.06	427.96	427.96	427.96	428.06	429.16
3..................	429.06	431.26	429.66	430.96	431.06	428.06	428.06	427.96	627.96	427.96	428.06	428.86
4..................	429.06	431.06	429.56	431.46	430.26	428.46	428.06	427.96	427.96	427.96	428.06	428.76
5..................	429.26	431.06	429.46	431.56	430.06	429.26	428.26	427.96	428.46	427.96	428.06	428.86
6..................	433.96	432.86	429.26	432.76	429.76	430.66	428.06	427.96	428.26	427.96	428.26	428.86
7..................	434.46	434.46	429.46	434.96	429.86	429.26	428.06	427.96	428.06	427.96	428.26	428.76
8..................	432.46	432.46	429.16	433.96	429.86	428.66	428.06	427.96	427.96	427.96	428.26	429.66
9..................	430.46	431.06	429.06	431.46	429.06	428.06	428.06	427.96	427.96	427.96	428.66	429.46
10..................	430.46	431.26	429.26	430.46	430.46	428.86	428.06	427.96	427.96	427.96	428.46	429.46
11..................	430.46	431.26	430.26	429.96	431.46	429.26	428.06	427.96	427.96	427.96	428.26	429.26
12..................	431.46	431.46	429.76	429.96	429.96	429.06	428.06	427.96	427.96	427.96	428.16	428.86
13..................	430.86	431.06	429.46	431.16	429.06	428.96	428.06	427.96	427.96	427.96	428.16	428.86
14..................	430.86	430.66	429.36	436.66	429.66	426.96	428.06	427.96	427.96	427.96	428.06	429.26
15..................	431.36	431.06	429.16	431.16	429.06	428.96	428.06	427.96	427.96	427.96	428.06	429.66
16..................	430.86	430.96	429.26	430.46	428.76	428.76	428.06	427.96	427.96	427.96	428.26	429.46
17..................	430.16	430.86	429.16	430.46	429.16	428.76	428.06	428.86	427.96	427.96	429.26	428.86
18..................	430.26	430.66	429.16	430.66	429.36	429.26	427.96	428.56	427.96	427.96	429.76	428.86
19..................	430.16	430.16	429.06	430.46	429.16	429.26	427.96	428.66	427.96	427.96	428.96	428.66
20..................	430.26	436.06	429.06	430.46	428.66	428.86	428.06	428.66	427.96	427.96	428.66	428.06
21..................	430.26	436.46	429.06	430.36	428.66	428.86	427.96	428.66	427.96	427.96	429.76	428.76
22..................	430.16	434.46	429.16	430.76	428.66	428.76	427.96	428.46	427.96	427.96	429.96	428.76
23..................	431.26	432.46	429.06	430.16	428.46	428.66	428.06	428.26	427.96	429.16	430.26	428.86
24..................	436.46	431.46	429.36	429.86	428.46	428.66	428.86	428.26	427.96	429.26	430.06	428.86
25..................	436.16	434.86	430.26	429.76	428.26	428.66	428.96	428.16	427.96	428.26	429.46	428.86
26..................	434.46	434.06	431.46	429.86	428.16	428.56	428.86	428.26	427.96	428.46	428.46	428.76
27..................	432.46	432.66	430.16	429.66	428.06	428.66	428.46	428.16	427.96	428.46	429.26	428.66
28..................	431.96	430.06	429.76	430.16	428.16	428.06	428.06	428.16	427.96	428.46	428.86	428.66
29..................	431.96	......	430.26	429.86	428.46	428.06	428.06	428.06	427.96	428.46	429.86	428.76
30..................	431.86	......	429.96	429.96	428.26	428.16	427.96	427.96	427.96	428.26	429.66	428.76
31..................	431.86	......	429.76	......	428.16	......	427.96	427.96	......	427.96	......	428.66

MOHAWK RIVER ABOVE STATE DAM AT ROME, N. Y.

A vertical gage with painted tenth-foot marks is attached to a large elm tree in the entrance to the Erie canal feeder about 100 feet up-stream from the right-hand end of the State dam. Readings are taken each morning by John Phillips. The zero of the gage is at elevation 430.00.

Current-meter measurements were made during 1909 in the feeder at the highway bridge just above the State dam as shown by the following table. Measurements of the adjacent Oriskany feeder and of the Erie canal east of Rome are also given in the accompanying tables.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River above State Dam at Rome, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	431.60	433.00	432.00	432.70	434.50	430.60	430.80	430.00	430.50	429.50	431.00	431.90
2	431.50	433.00	432.00	433.10	434.00	430.20	430.80	429.40	430.60	429.60	431.00	431.90
3	431.70	432.80	432.20	433.40	433.60	430.30	430.90	429.40	430.50	429.50	431.20	431.60
4	431.60	432.80	432.10	434.10	432.80	431.20	430.80	429.40	430.20	429.20	431.00	431.50
5	431.80	432.80	432.00	434.10	432.60	431.80	430.90	429.20	431.40	429.50	431.00	431.20
6	436.50	433.40	431.90	435.60	432.30	433.20	430.40	429.20	431.20	429.60	431.20	431.40
7	437.60	437.60	432.00	437.40	432.40	431.80	430.30	429.20	430.60	429.20	431.00	431.40
8	435.00	434.80	431.80	436.40	432.40	431.20	430.50	429.20	430.00	429.20	431.10	432.40
9	433.00	433.00	431.70	434.00	432.20	431.20	430.50	429.10	430.00	429.20	431.40	432.20
10	433.00	433.00	431.80	432.80	432.90	431.30	430.50	429.10	429.00	429.30	431.20	432.20
11	433.00	432.80	432.80	432.30	434.00	431.70	430.60	429.10	429.00	429.40	431.20	432.00
12	434.00	432.60	432.30	432.30	432.50	431.60	430.40	429.10	429.00	429.50	431.20	431.60
13	433.50	432.40	432.00	433.50	432.20	431.70	430.00	429.10	429.00	429.50	431.00	431.60
14	433.50	432.30	432.00	437.40	431.70	431.60	429.90	429.10	429.40	429.40	431.00	432.00
15	434.00	432.20	431.70	433.20	431.60	431.70	429.90	429.10	429.20	249.40	431.00	432.40
16	433.50	432.30	431.80	432.80	431.30	431.50	429.90	429.60	429.60	429.40	431.20	432.20
17	433.00	432.30	431.70	432.80	431.70	431.50	429.70	431.60	429.40	429.40	432.10	431.80
18	433.00	432.40	431.70	433.00	431.90	432.00	429.70	431.30	429.20	429.40	432.50	431.60
19	433.00	432.20	431.70	432.80	431.70	432.00	429.70	431.40	429.40	430.40	431.70	431.40
20	4 3.00	437.10	431.70	432.80	431.20	431.60	430.00	431.40	429.30	430.40	431.40	431.40
21	433.00	438.00	431.70	432.90	431.20	431.60	430.00	431.30	429.30	430.60	432.50	431.50
22	433.00	436.00	431.60	433.20	431.20	431.50	430.00	431.00	429.20	430.70	432.70	431.50
23	434.00	433.60	431.70	432.70	431.20	431.40	430.00	430.90	429.00	431.80	433.00	431.60
24	439.00	433.80	432.00	432.40	431.20	431.40	431.60	430.90	4 9.20	4 2.00	432.80	431.60
25	436.70	436.00	432.90	432.20	431.00	431.20	431.70	430.50	429.20	431.00	432.40	431.60
26	435.20	436.00	434.00	432.30	431.00	431.20	431.60	431.20	429.20	431.00	432.40	431.50
27	434.80	433.60	432.70	432.10	430.40	431.40	431.00	431.10	429.40	431.20	432.20	431.40
28	434.40	432.00	432.40	432.60	430.50	430.30	430.50	431.10	429.20	431.20	431.80	431.40
29	434.00	......	432.80	432.40	431.20	430.30	430.00	431.00	429.20	431.40	432.60	431.50
30	433.00	......	432.40	432.50	430.60	430.40	430.00	430.00	429.40	431.20	432.40	431.50
31	433.00	......	432.30	......	430.60	......	430.00	430.00	......	430.80	......	431.40

Current-meter Discharge Measurements of Flow in Erie Canal Feeder at Rome, N. Y.

DATE.	Hydrographer.	Gage height.a	Area of section.	Mean velocity.	Discharge.
		Feet.	*Square feet.*	*Ft. per second.*	*Second-feet.*
1909.					
May 14	E. C. Niles	9.90	150	1.00	150
May 27	Clark and Angus	12.57	78.2	2.32	181
June 18	E. C. Niles	9.80	100	0.918	91.8
July 16	J. P. Newton	12.35	109	2.67	291
Aug. 11	Clark and Angus	13.00	75.4	1.88	142
Aug. 17	J. P. Newton	10.10	150	0.301	45.1
Sept. 28	H. A. Gehring	12.50	89	1.70	151
Nov. 5	E. C. Niles	10.65	135	1.56	210

a Below reference point.

Current-meter Discharge Measurements of Oriskany Feeder at Oriskany, N. Y.

DATE.	Hydrographer.	Meter number.	Area of section.	Mean velocity.	Discharge.
			Square feet.	*Ft. per second.*	*Second-feet.*
1909.					
May 12..	E. C. Niles	462	71.0	1.93	137
May 28..	Clark and Angus	559	81.0	2.70	219
Aug. 17..	J. P. Newton	559	84.5	0.755	63.8

Current-meter Discharge Measurements of Erie Canal East of Rome, N. Y.

DATE.	Hydrographer.	Meter number.	Area of section.	Mean velocity.	Discharge.
			Square feet.	*Ft. per second.*	*Second-feet.*
1909.					
May 28...	Clark and Angus	559	391	0.473	185
Aug. 17..	J. P. Newton	559	386	0.388	138

Mohawk River at Floyd Avenue, Rome, N. Y.

A box-and-chain gage was erected by E. F. Weeks, of this Department, at Riverside bridge crossing Mohawk river near Rome, July 9, 1907. The gage is attached to the up-stream hand-rail near the left-hand end of the bridge. The gage reads from zero to 7.5 feet. The standard chain length is 18.98 feet and the elevation of water-surface, when the gage reads zero, is 445.16. Readings are taken each morning and afternoon by G. G. Williams. A bench-mark located at the junction of the up-stream wing wall and left-hand abutment is at elevation 460.80. The channel is straight for some distance up-stream and down-stream from the bridge. Current-meter measurments are made on the down-stream side, the initial point being the face of the right-hand abutment. A crude dam or barrier of boulders has been placed across the stream a few hundred feet down-stream for the purpose of raising the water-level to produce an ice pond.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River at Floyd Ave. Bridge, Rome, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	447.36	446.78	447.16	448.16	449.49	446.76	446.73	446.65	446.50	446.70	446.72	446.72
2	447.21	446.76	447.06	447.89	448.11	446.71	446.73	446.60	446.55	446.70	446.72	446.78
3	447.26	446.76	447.24	448.53	447.79	446.81	446.79	446.60	446.52	446.75	446.62	446.65
4	447.08	446.76	447.18	448.89	447.76	446.89	446.63	446.60	446.60	446.72	446.62	446.60
5	447.86	446.94	447.11	249.29	447.33	447.83	446.66	446.52	446.70	446.72	446.65	446.55
6	449.96	448.48	447.11	450.26	447.23	447.59	446.61	446.55	446.62	446.70	446.62	446.55
7	448.08	449.21	447.06	451.51	447.39	447.06	446.63	446.52	446.60	446.65	446.68	446.58
8	447.66	447.96	446.98	449.73	447.23	446.96	446.96	446.50	446.58	446.65	446.75	447.15
9	447.86	447.86	447.11	449.26	447.09	446.99	446.63	446.50	446.58	446.60	447.00	447.30
10	447.54	448.18	447.21	447.73	448.11	447.16	446.63	446.50	446.60	446.62	446.85	446.60
11	447.18	447.26	447.06	447.69	448.46	447.23	446.61	446.50	446.55	446.62	446.70	446.70
12	447.06	447.78	447.04	447.76	447.43	447.01	446.61	446.52	446.52	446.68	446.68	447.10
13	446.91	447.08	447.04	449.59	447.16	446.93	446.61	446.50	466.52	446.60	446.62	447.25
14	447.11	447.14	446.91	451.01	447.09	446.89	446.63	446.45	446.50	446.60	446.60	447.20
15	447.16	447.81	446.96	448.66	446.99	446.83	446.71	446.50	446.50	446.55	446.60	447.15
16	447.26	447.94	446.88	447.98	447.46	446.93	446.73	447.05	446.58	446.65	446.62	447.18
17	447.31	447.58	446.84	448.16	447.23	446.83	446.66	446.70	446.40	446.80	447.05	447.10
18	447.36	447.16	446.74	448.13	447.16	447.13	446.71	446.65	446.50	446.80	447.18	447.00
19	447.38	446.88	446.76	448.06	447.06	447.01	446.76	446.68	446.58	446.70	447.05	447.02
20	447.38	450.98	446.76	447.89	446.93	446.96	446.71	446.62	446.58	446.80	447.00	447.02
21	447.51	449.91	246.91	447.46	446.86	446.86	446.63	446.60	446.50	446.85	447.00	447.08
22	447.58	447.66	446.78	448.23	446.86	446.86	446.63	446.50	446.50	446.85	447.28	447.00
23	448.08	447.24	446.88	448.03	446.71	446.80	447.01	446.50	445.50	447.05	447.75	447.02
24	450.51	449.21	446.96	447.26	446.76	446.80	447.06	446.48	446.60	447.10	447.30	447.00
25	449.06	448.84	448.98	447.13	446.69	446.73	446.91	446.35	446.65	446.98	447.00	447.00
26	448.38	447.81	448.58	447.21	446.63	446.76	446.76	446.52	446.50	446.92	447.30	447.02
27	447.51	447.36	448.46	447.13	446.69	446.71	446.69	446.55	446.50	446.78	446.78	447.00
28	447.31	447.16	447.51	447.71	446.79	446.66	446.71	446.52	446.50	446.70	446.88	446.98
29	447.04	......	447.51	447.16	446.79	446.66	446.66	446.58	446.50	446.70	447.38	446.92
30	447.11	......	447.36	448.33	446.61	446.72	446.71	446.55	446.55	446.62	446.98	446.88
31	446.96	......	447.61	......	446.71	......	446.62	446.50	......	446.70	......	447.06

Current-meter Discharge Measurements of Mohawk River at Floyd Ave. Bridge, Rome, N. Y.

DATE.	Hydrographer.	Gage height.	Area of section.	Mean velocity.	Discharge.
		Feet.	*Square feet.*	*Ft. per second.*	*Second-feet.*
1909.					
May 27	Clark and Angus	1.5	364	0.59	214
June 18	E. C. Niles	2.1	391	1.31	512
July 16	J. P. Newton	1.68	346	0.68	234
Aug. 11	Clark and Angus	1.4	362	0.43	156
Aug. 18	J. P. Newton	1.65	362	0.78	281
Sept. 28	H. A. Gehring	1.42	363	0.35	126
Nov. 5	E. C. Niles	1.65	373	0.61	229

MOHAWK RIVER BELOW DAM AT RIDGE MILLS NEAR ROME, N. Y.

Ridge Mills is located on Mohawk river two miles north of Rome, N. Y. The dam and water-power are utilized in conjunction with the Municipal Water Works Pumping Station. The gage was established at the lower line of the city property May 3, 1904. The gage is a vertical staff attached to a tree on the right-hand bank of the Mohawk river one-third mile below the dam. The gage zero is at elevation 454.79. A reading is taken each morning by Daniel Brown.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River below Dam at Ridge Mills near Rome, N. Y.(b)

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1	455.99	456.39	456.49	457.59	460.59	456.89	455.89	455.59	455.69	455.69	455.69	456.29
2	456.49	456.09	456.29	457.29	457.59	455.99	455.89	455.69	455.59	455.69	455.69	455.69
3	456.29	456.79	456.79	457.09	457.49	456.09	455.79	455.69	455.59	455.59	455.69	455.59
4	455.99	456.79	456.69	456.59	457.09	455.89	455.79	455.69	455.59	455.59	455.69	455.89
5	456.29	456.79	456.59	456.49	456.49	455.89	455.79	455.69	455.59	455.59	455.59	455.79
6	456.09	456.79	456.39	458.69	456.29	455.89	455.79	455.59	455.59	455.59	455.59	456.09
7	456.29	457.09	456.39	458.59	456.39	455.89	456.39	655.79	455.69	455.59	455.69	456.09
8	456.39	457.19	456.29	458.59	460.19	455.99	456.99	455.69	455.59	455.59	455.79	456.79
9	456.09	457.09	456.29	460.79	457.19	455.99	455.89	455.79	455.59	455.59	456.09	456.59
10	456.09	456.79	456.29	457.09	456.89	456.09	455.99	455.69	455.59	455.59	456.09	456.39
11	456.19	456.89	456.29	457.29	456.39	455.89	455.79	455.79	455.69	456.19	456.39	456.29
12	456.09	456.29	456.29	457.09	456.49	455.99	455.79	456.09	455.69	455.89	456.59	456.59
13	456.09	456.79	456.79	457.09	456.49	455.89	455.69	455.69	455.59	455.59	455.69	456.29
14	456.79	456.99	457.69	456.79	456.29	455.89	455.69	455.69	455.59	455.59	455.89	456.59
15	456.59	458.09	457.79	456.79	456.49	455.99	455.59	455.69	455.59	455.69	455.89	456.29
16	456.49	*a*	460.69	457.39	456.39	455.99	455.59	455.69	455.69	455.79	455.89	456.79
17	456.19	458.19	458.19	456.39	456.39	456.09	455.79	455.59	455.69	455.69	455.89	456.29
18	455.99	457.49	457.39	456.69	456.49	456.09	458.49	456.09	455.59	455.59	455.89	456.29
19	455.99	457.29	457.39	457.39	455.79	455.99	458.39	455.89	455.59	455.59	455.89	456.19
20	455.99	457.09	456.39	456.89	455.89	459.19	456.39	455.79	455.59	455.59	456.59	455.99
21	455.89	456.99	455.99	456.49	455.89	455.99	456.09	455.69	455.59	455.59	456.29	455.89
22	455.99	456.79	456.29	456.59	455.79	455.99	458.19	455.59	455.59	455.59	456.29	455.89
23	456.09	456.39	456.89	456.59	455.69	455.89	456.49	455.59	455.59	455.59	455.99	456.19
24	455.99	456.39	457.79	456.49	455.69	455.99	456.09	455.59	455.49	455.59	456.99	456.19
25	455.89	456.39	457.29	456.59	455.69	455.99	455.89	455.59	455.69	455.79	457.49	456.19
26	455.99	456.19	457.49	456.59	455.59	455.99	456.19	455.69	455.59	455.89	456.99	456.39
27	455.99	456.19	460.59	456.29	456.39	455.89	455.99	455.69	455.59	456.19	456.69	455.89
28	455.99	456.19	460.09	456.69	456.29	455.89	455.89	455.69	455.59	455.89	456.39	455.79
29	455.89	456.19	461.19	456.39	455.99	455.89	455.69	455.69	456.29	456.39	455.99	455.79
30	455.79	......	457.99	456.49	455.89	455.79	455.79	455.69	455.69	455.89	456.09	456.08
31	456.09	......	457.99	......	456.89	......	455.69	455.09	......	455.79	......	455.89

a No record.

b This table supersedes that appearing in State Engineer's report for 1908, which is referred to incorrect datum.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River below Dam at Ridge Mills near Rome, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	455.99	456.19	455.79	457.49	457.69	455.79	455.69	455.69	355.39	455.69	455.69	455.69
2	456.19	456.29	456.09	457.99	458.39	455.49	455.69	455.59	355.49	455.69	455.59	456.69
3	455.99	456.39	456.49	458.49	457.09	455.79	455.69	455.59	455.49	455.69	455.59	455.79
4	455.99	455.99	456.39	458.49	457.19	455.79	455.69	455.49	455.09	455.69	455.59	455.59
5	456.29	456.09	455.99	458.99	456.59	456.79	455.59	455.49	455.89	455.49	455.69	455.59
6	458.69	457.79	455.99	460.09	456.49	457.19	455.59	455.49	455.89	455.69	455.69	455.59
7	457.79	457.19	455.99	462.59	456.59	456.29	455.59	455.49	455.59	455.59	455.69	455.49
8	456.69	456.79	455.69	461.19	456.59	456.09	455.49	455.49	455.49	455.39	455.69	455.49
9	456.49	455.99	455.59	458.39	456.19	456.19	455.49	455.69	455.49	455.49	455.99	455.69
10	456.79	455.99	455.89	458.59	456.89	456.19	455.49	455.49	455.39	455.49	455.69	455.59
11	456.29	456.69	456.99	457.69	458.79	456.09	455.69	455.49	455.39	455.49	455.69	455.49
12	456.29	456.39	456.39	456.89	456.79	456.19	455.69	454.79	455.49	455.59	455.59	455.99
13	455.99	456.19	456.19	458.69	456.29	456.19	455.69	454.79	455.49	455.59	455.59	455.49
14	455.99	456.29	455.99	*a*	456.29	456.09	455.69	454.79	455.49	455.49	455.59	575.69
15	456.19	456.39	455.99	458.69	456.09	455.69	455.69	455.29	455.49	455.49	455.59	455.79
16	455.89	455.99	455.99	457.69	456.59	455.59	455.69	455.89	455.49	455.49	455.79	455.69
17	455.89	456.29	455.89	457.59	456.59	455.69	455.69	455.49	455.49	455.79	456.59	455.69
18	456.39	456.19	455.79	457.79	456.29	456.49	455.69	455.79	455.39	455.79	456.39	495.69
19	455.79	456.19	455.59	457.69	456.09	456.19	455.79	455.69	455.49	455.99	456.19	455.69
20	455.89	460.19	455.79	457.59	456.09	456.09	455.69	455.59	455.49	455.79	455.99	455.79
21	455.89	458.19	455.59	456.89	455.79	455.89	455.69	455.49	455.49	455.59	456.09	455.79
22	456.39	457.09	455.69	458.29	455.79	555.79	455.69	455.39	455.49	456.19	456.39	455.79
23	456.59	456.49	455.69	457.09	455.79	455.79	455.79	455.39	455.39	455.39	456.89	455.79
24	460.99	456.59	455.79	456.49	455.69	455.79	456.09	455.59	455.59	456.09	456.39	455.79
25	460.29	459.29	457.79	456.29	455.79	455.79	456.09	455.19	455.49	455.99	455.89	455.79
26	457.79	457.19	458.49	456.39	455.49	455.69	455.79	455.39	455.49	455.79	455.89	455.69
27	456.69	456.59	457.19	456.29	455.59	455.79	455.69	455.39	455.49	455.79	455.69	455.59
28	456.29	456.19	456.59	457.49	455.69	455.59	455.69	455.39	455.39	455.79	455.69	455.59
29	455.99	......	457.39	456.29	455.79	455.79	455.69	455.39	455.39	455.59	456.79	455.59
30	455.79	......	456.99	456.29	455.59	455.79	455.69	455.49	455.49	455.69	456.09	455.49
31	455.99	......	456.59	......	455.59	......	455.59	455.49	......	455.59	......	456.19

a No record.

MOHAWK RIVER ABOVE DAM AT RIDGE MILLS NEAR ROME, N. Y.

The gage is attached to the up-stream face of the left-hand abutment of the dam. The zero mark was at elevation 464.63 preceding January 22, 1907, and at elevation 465.00 after that date. Readings are taken each morning by Daniel Brown. The stage of the stream above the dam is affected by diversion to the turbines in the adjacent pumping station. Black River canal runs parallel to Mohawk river at this point. Current-meter measurements, to determine the volume of flow in the canal, are shown in the accompanying table.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River above Dam at Ridge Mills near Rome, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	466.00	465.80	466.10	467.00	467.10	466.00	465.90	465.80	465.40	465.80	465.80	465.90
2	466.00	466.00	466.20	467.30	467.50	465.70	465.90	465.80	465.50	465.80	465.80	466.50
3	466.00	466.00	466.50	467.50	466.90	466.00	466.00	465.80	465.10	465.80	465.80	465.90
4	466.00	466.00	466.40	467.50	466.90	466.00	465.80	465.70	465.10	465.80	465.80	465.70
5	466.00	466.10	466.00	467.80	466.50	466.70	465.80	465.70	466.00	465.60	465.90	465.70
6	468.30	467.00	466.10	468.30	466.40	466.90	465.80	465.40	466.00	465.80	465.90	465.70
7	467.20	467.10	466.10	469.50	466.50	466.30	465.80	465.50	465.80	465.70	465.80	465.60
8	466.60	466.80	466.10	468.60	466.50	466.20	465.70	465.50	466.00	465.30	465.80	465.60
9	466.40	466.70	466.00	467.50	466.40	466.30	465.70	465.80	466.00	465.70	466.10	465.30
10	466.30	466.10	466.10	467.50	466.70	466.40	465.70	465.70	465.50	465.60	465.90	465.60
11	466.30	466.60	466.80	466.50	467.60	466.30	465.80	465.70	465.10	465.60	465.90	465.50
12	466.30	466.30	466.40	466.60	466.70	466.30	465.70	465.00	465.10	465.90	465.80	465.00
13	466.10	466.30	466.30	467.50	466.40	466.30	465.80	465.30	465.20	465.80	465.80	465.50
14	466.10	466.40	466.20	469.60	466.40	466.20	465.90	465.00	465.00	465.70	465.80	465.80
15	466.20	466.40	466.10	467.60	466.20	466.20	465.90	465.30	465.50	465.70	465.80	465.90
16	466.10	466.20	466.10	467.10	466.50	466.00	465.90	466.00	465.10	465.40	466.00	465.80
17	466.10	466.20	466.10	467.10	466.50	466.00	465.90	466.00	465.20	466.00	466.70	465.80
18	466.20	466.10	466.00	467.70	466.30	466.50	465.90	466.00	465.00	466.00	466.40	465.50
19	465.80	466.10	465.90	467.10	466.20	466.30	466.00	465.80	465.30	466.10	466.30	465.50
20	466.00	468.00	466.00	467.00	466.20	466.20	466.00	465.70	465.70	466.00	466.10	465.70
21	466.00	467.40	465.90	466.70	466.00	466.00	465.90	465.50	465.10	465.80	466.20	465.70
22	466.20	466.90	466.00	467.40	466.00	466.00	465.90	465.30	465.60	466.30	466.40	465.60
23	466.60	466.40	466.00	466.90	466.00	466.00	465.00	465.50	465.00	466.30	466.70	465.80
24	468.60	466.50	466.00	466.50	466.00	466.00	466.30	465.90	465.70	466.10	466.40	465.70
25	468.20	467.80	467.20	466.40	466.00	466.00	466.30	465.40	465.60	466.10	466.10	465.70
26	467.20	467.00	467.50	466.50	465.90	466.00	466.00	465.70	465.40	466.00	466.10	465.80
27	466.80	466.50	466.90	466.40	465.90	466.00	466.00	465.70	465.30	466.00	465.80	465.60
28	466.30	466.30	466.50	467.00	466.00	465.80	465.90	465.30	465.00	466.00	465.90	465.60
29	466.40	......	467.00	466.40	466.00	466.00	465.90	465.30	465.00	465.80	466.60	465.60
30	466.10	......	466.80	466.40	466.00	466.00	465.90	465.60	465.60	465.90	466.20	465.00
31	466.00	......	466.50	......	465.90	......	465.80	465.40	......	465.80	......	465.40

Current-meter Discharge Measurements of Black River Canal at Ridge Mills near Rome, N. Y.

DATE.	Hydrographer.	Gage height.[a]	Area of section.	Mean velocity.	Discharge.
1909.		*Feet.*	*Square feet.*	*Ft. per second.*	*Second-feet.*
June 18	E. C. Niles	9.80	158	0.747	118
Aug. 11	Clark and Angus	10.00	150	0.567	85
Aug. 18	J. P. Newton	9.90	159	0.620	98.6
Sept. 28	H. A. Gehring	9.75	151	0.768	116
Nov. 5	E. C. Niles	10.00	152	0.730	111

[a] Reference point.

MOHAWK RIVER NEAR LOCK NO. 7 BELOW DELTA, N. Y.

A current-meter gaging station was established at the highway bridge over the Mohawk river just below Lock No. 7, Black River canal, and about two miles below Delta, August 20, 1905, by C. A. Poole. The gage is a vertical board, graduated to feet and tenths, and is secured to the south wing of the east abutment of bridge with its zero at elevation 479.0 Observations of the stage of the stream are taken each morning and evening by Fred Miller.

During ordinary stages of the river, discharge measurements have been made from the bridge, which consists of one span of 101.6 feet. In low water the measurements are made by fording the stream about 1,000 feet above the bridge, where there is a straight channel of uniform cross-section. The channel at the bridge is of gravel and of uniform section directly under the bridge, but there is a small island about 150 feet up-stream, which affects the flow during the low stages.

The yield of the watershed above this point is influenced considerably by the Black River canal, which receives its initial supply from the Black river watershed and an additional supply from the Mohawk river at Delta. The diversion at Delta is in some measure counterbalanced by the water which returns to the river from seepage through the canal banks and flow over waste-weirs.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River near Lock No. 7 below Delta, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	480.10	479.80	480.35	481.20	483.47	480.10	480.05	480.00	480.05	480.00	480.40	480.50
2	480.20	479.85	480.30	481.75	482.25	480.05	480.05	480.05	480.00	479.90	480.20	480.00
3	480.00	479.95	480.85	482.25	481.40	480.15	480.05	480.05	480.05	479.80	480.30	480.15
4	480.05	480.00	480.65	482.65	481.45	480.35	480.05	480.10	480.05	479.80	480.20	480.00
5	482.78	480.20	480.50	483.35	480.90	482.50	480.00	480.00	480.45	479.70	480.15	480.05
6	484.15	483.53	480.25	483.90	480.85	481.65	480.05	480.10	480.15	479.70	480.15	480.05
7	481.95	481.90	480.05	485.65	481.00	480.80	480.05	480.05	480.05	479.80	480.20	480.15
8	481.60	481.40	480.15	483.60	480.90	480.50	480.10	480.00	480.00	479.80	480.35	480.65
9	481.45	480.95	480.25	482.05	480.70	480.55	480.00	480.05	480.05	479.50	480.50	480.25
10	481.00	480.20	480.60	481.45	481.45	480.70	480.05	480.00	480.00	479.70	480.35	480.15
11	480.55	480.05	481.05	481.45	482.30	480.80	480.00	480.05	480.00	479.75	480.35	480.05
12	480.10	480.00	480.65	481.15	481.10	480.65	480.05	480.05	479.75	479.60	480.40	480.15
13	479.90	480.60	480.75	483.67	480.75	480.50	480.10	480.10	479.60	479.65	480.40	480.30
14	479.90	480.45	480.30	485.70	480.70	480.20	480.00	480.00	479.70	479.65	480.40	480.45
15	480.05	480.55	480.25	483.15	480.55	480.05	480.05	480.05	479.80	479.80	480.45	480.35
16	480.05	490.55	480.30	481.50	481.00	480.05	480.10	480.55	479.90	480.00	480.50	480.10
17	480.05	480.60	480.25	482.25	480.75	480.05	480.00	480.10	480.00	480.45	481.60	480.00
18	479.90	480.20	480.05	482.35	480.80	480.80	480.00	480.00	480.00	480.45	480.75	480.05
19	479.90	480.55	480.20	481.45	480.75	480.40	480.30	480.05	479.80	480.45	480.65	480.20
20	479.90	482.95	480.00	481.40	480.65	480.15	480.05	480.10	479.80	480.20	480.55	480.00
21	479.90	482.30	480.05	481.05	480.50	480.05	480.05	480.00	479.70	480.35	480.65	480.05
22	480.05	481.40	480.10	481.55	480.15	480.00	480.00	480.00	479.80	480.80	481.25	480.30
23	480.85	480.50	480.20	481.10	480.00	480.10	480.55	480.00	479.80	480.75	481.55	480.30
24	484.93	483.00	480.30	480.80	480.15	480.05	480.75	480.10	480.00	480.55	480.85	480.25
25	482.15	483.70	483.17	480.70	480.00	480.15	480.10	480.00	479.80	480.35	480.80	480.45
26	481.40	481.75	482.15	480.75	480.05	480.00	480.00	480.00	479.80	480.35	480.65	480.50
27	480.40	480.90	481.25	480.75	480.05	480.00	480.05	480.10	479.70	280.25	480.55	480.55
28	480.40	480.50	481.10	481.30	480.20	480.05	480.10	480.10	479.80	480.35	480.40	480.45
29	480.20	......	481.25	480.75	480.00	480.05	480.00	480.00	479.70	480.45	480.80	480.45
30	480.00	......	481.05	482.73	480.00	480.00	480.00	480.05	480.00	480.30	480.90	480.50
31	479.90	......	481.60	......	480.05	......	480.00	480.00	......	480.35	......	480.20

MOHAWK RIVER BELOW DAM AT DELTA, N. Y.

A vertical staff gage was erected on the down-stream end of the feed mill on the left-hand bank of the Mohawk river below dam at Delta, May 3, 1904. The gage is divided to feet and tenths by coppered staples and reads from zero to nine feet. Readings of this gage and also of the gage above the dam are taken each morning by E. A. Evans. The zero mark of the gage below the dam is at elevation 502.00.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River below Dam at Delta, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	502.90	502.80	......	504.75	506.40	502.70	502.90	502.70	502.70	502.70	502.90	502.80
2	502.90	502.90	......	504.50	504.30	502.80	502.90	502.70	502.60	502.70	502.80	502.80
3	502.90	502.80	503.50	505.60	504.10	502.80	503.00	502.70	502.50	502.80	502.80	502.70
4	502.90	502.80	503.30	505.10	504.00	502.70	502.90	502.50	502.60	502.80	502.80	502.70
5	504.80	502.80	503.10	505.30	503.50	504.80	502.90	502.50	503.10	502.80	502.70	502.70
6	507.00	506.00	503.00	506.30	503.40	504.00	502.80	502.50	502.90	502.70	502.90	502.70
7	504.90	*a*	503.00	509.10	303.80	503.00	502.70	502.50	502.80	502.60	502.90	502.60
8	503.60	*a*	503.00	506.30	503.50	503.10	502.70	502.60	502.60	502.70	502.70	502.70
9	503.30	*a*	503.00	504.90	503.30	503.10	502.70	502.70	502.70	502.70	503.00	502.70
10	503.30	*a*	503.10	504.30	503.80	503.00	502.80	502.50	502.60	502.60	502.90	502.70
11	503.30	*a*	503.80	504.00	505.20	503.30	502.80	502.30	502.70	502.60	502.90	502.70
12	503.20	*a*	503.40	503.80	503.60	503.10	502.80	502.50	502.60	502.90	502.80	502.70
13	503.20	*a*	503.20	505.30	503.30	503.10	502.70	502.40	502.60	502.80	502.80	502.70
14	503.10	503.10	503.10	509.05	503.10	503.20	502.70	502.30	502.70	502.80	502.80	502.70
15	502.90	503.10	503.10	505.30	503.10	503.00	502.80	5C2.50	502.60	502.80	502.80	502.80
16	502.80	503.00	503.00	504.40	503.50	502.80	502.80	502.40	502.80	502.70	503.10	502.80
17	502.80	503.20	503.00	504.60	503.40	592.70	502.80	502.70	502.60	503.30	504.20	502.80
18	502.80	503.10	502.90	504.30	503.40	503.70	502.80	502.90	502.60	503.00	503.50	502.80
19	502.70	502.90	502.70	504.30	503.20	503.10	502.80	502.90	502.60	503.10	503.30	502.70
20	502.80	506.30	502.70	504.30	503.10	503.00	502.80	502.70	502.50	503.00	503.00	502.70
21	502.80	*a*	502.60	503.70	503.00	502.80	502.80	502.50	502.50	503.00	503.10	502.70
22	502.90	*a*	502.70	505.00	503.00	502.90	502.70	502.60	502.40	503.30	503.30	502.70
23	503.50	*a*	502.90	503.80	503.00	502.90	503.60	502.40	502.50	503.50	504.30	502.70
24	507.30	505.70	503.00	503.40	502.90	502.90	503.70	502.40	502.80	503.10	503.30	502.70
25	506.30	*b*	506.05	503.30	502.90	502.90	503.10	502.50	502.70	503.00	503.00	502.70
26	504.50	*b*	504.70	503.30	502.80	502.80	503.00	502 60	502.70	503.00	503.10	502.70
27	503.60	*b*	503.90	503.10	502.70	502.80	502.90	502.50	502.60	503.00	502.80	502.70
28	503.50	*b*	503.70	504.10	503.00	502.60	502.80	502.40	502.60	503.00	502.80	502.60
29	503.30	......	503.90	503.30	502.80	502.90	502.70	502.70	502.60	502.90	503.70	502.60
30	503 10	......	503.80	504.85	502.80	502.90	502.70	502.60	502.80	502.90	503.10	502.30
31	503.00	......	503.60	......	502.70	......	502.70	502.60	......	502.90	......	502.30

a Ice obstruction. *b* No record.

MOHAWK RIVER ABOVE DAM AT DELTA, N. Y.

The gage above the dam was established May 3, 1904. The gage is attached to the face of the left-hand abutment. It is subdivided to tenths of feet by coppered staples and reads from 0 feet to 9 feet. The flow of the stream is utilized in the adjacent mills and in addition diversion is made to the Black River canal during the navigation season through the Delta feeder. The zero mark of the gage above the dam is at elevation 507.63. The crest of the dam is at elevation about 509.4.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Mohawk River above Dam at Delta, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	509.33	509.33	509.43	510.08	510.43	509.13	509.23	509.03	508.93	509.13	509.23	509.23
2	509.33	509.43	509.43	509.93	509.93	509.13	509.23	509.03	508.83	509.13	509.13	509.23
3	509.33	509.43	509.63	510.38	509.83	509.13	509.13	509.03	508.73	509.13	509.23	509.13
4	509.33	509.43	509.43	510.13	509.83	509.13	509.23	508.63	508.93	509.13	509.23	509.13
5	510.03	509.43	509.33	509.73	509.63	510.13	509.13	508.73	509.23	509.13	509.13	509.13
6	510.83	510.48	509.43	510.63	509.53	509.63	509.13	508.73	509.13	508.93	509.23	509.13
7	510.13	510.33	509.33	511.43	509.73	509.43	509.03	508.83	509.03	509.03	509.23	309.13
8	509.83	509.83	509.23	510.53	509.63	509.43	509.03	508.93	508.63	509.13	509.13	509.13
9	509.63	509.53	509.23	510.13	509.53	509.43	509.03	509.03	508.83	509.03	509.33	509.13
10	509.43	509.63	509.33	509.83	509.73	509.33	509.13	508.63	508.73	509.03	509.23	509.13
11	509.43	509.83	509.63	509.83	510.23	509.43	509.13	508.53	508.93	509.03	509.23	509.13
12	509.23	509.53	509.43	509.63	509.63	509.33	509.13	508.63	508.93	509.23	509.13	509.13
13	509.13	509.43	509.43	509.83	509.53	509.33	509.13	508.63	508.93	509.13	509.13	509.13
14	509.33	509.53	509.33	511.73	509.43	509.33	509.03	508.33	509.03	509.13	509.23	509.13
15	509.33	509.63	509.33	510.33	509.43	509.23	509.03	508.83	509.03	509.13	509.23	509.23
16	509.33	509.43	509.23	511.03	509.63	509.23	509.03	509.33	309.23	509.13	509.43	509.23
17	509.33	509.43	509.23	510.13	509.53	509.13	509.03	509.03	509.03	509.43	509.83	509.23
18	509.33	509.43	509.23	509.93	509.53	509.63	509.03	509.13	509.03	509.23	509.53	509.23
19	509.13	509.33	509.23	509.93	509.43	509.33	509.03	509.13	509.03	509.33	509.43	509.13
20	509.23	510.63	509.23	509.93	509.33	509.23	509.13	509.13	508.93	509.23	509.33	509.13
21	509.33	510.23	509.13	509.63	509.33	509.13	509.03	508.73	508.93	509.23	509.43	509.13
22	509.33	510.03	508.23	510.23	509.33	509.23	508.93	508.83	508.83	509.43	509.53	509.13
23	509.63	509.53	509.33	509.73	509.33	509.23	509.53	508.63	509.03	509.53	509.93	509.13
24	510.73	510.38	509.33	509.63	509.3	509.33	509.63	508.63	509.23	509.33	509.53	509.13
25	510.43	510.43	510.48	509.53	509.33	509.23	509.33	508.63	509.13	509.23	509.23	509.13
26	510.03	510.03	510.13	509.53	509.13	509.23	509.23	508.83	509.03	509.23	509.43	509.13
27	509.83	509.73	509.73	509.43	509.03	509.13	509.23	508.73	509.03	509.23	509.23	509.13
28	509.53	509.53	509.63	509.83	509.33	509.03	509.13	508.63	509.03	509.23	509.23	509.03
29	509.43	......	509.73	509.43	509.13	509.23	509.13	508.93	509.03	509.23	509.63	509.03
30	509.43	......	509.63	510.08	509.23	509.23	509.13	508.83	509.23	509.23	509.43	508.63
31	509.43	......	509.53	......	509.13	......	509.03	508.83	......	509.23	......	509.03

UPPER HUDSON RIVER DRAINAGE BASIN.

DESCRIPTION.

Upper Hudson river comprises the drainage basin above tidewater influence at Troy and also above the mouth of Mohawk river at Waterford.

The head-water region is mountainous in character, in general heavily wooded, and dotted with numerous lakes and ponds. The rocks, belonging to the oldest formation and mainly granite, are either bare or covered with only a layer of spruce duff, humus and forest litter. The river emerges from the mountain region a few miles west of Glens Falls, and thence to Troy the topography is moderately rolling and the surface soil is chiefly sand.

The fall in the upper portion of the course is very rapid, amounting to about 64 feet per mile from Lake Tear-of-the-Clouds to North creek, a distance of about 52 miles. From the mouth of North creek to the mouth of the Sacandaga the descent is nearly 14 feet per mile, distributed among rapids which diminish in frequency as the Sacandaga is approached. In the succeeding 26 miles to Fort Edward the river descends 418 feet more, but of this 175 feet is comprised within the three abrupt pitches at Palmer, Glens and Bakers falls, while most of the remainder occurs in the rapids between Jessups Landing and the oxbow above Glens Falls. Between Glens Falls and Troy nearly the entire fall of the river is utilized for the development of water-power.

The flow of the upper Hudson is controlled to some extent during the dry season by the use of Indian lake storage reservoir, and the facilities for storage works in this part of the basin are unsurpassed. The entire region is dotted with ponds and lakes, many of them of large size and fed from extensive drainage areas. Saratoga lake serves as a regulator of Fish creek, and there is a small reservoir at the head waters of the Hoosic.

Gaging stations have been maintained on the upper Hudson river in 1909 at various stations for the purpose of determining the water-surface elevation. In addition records are kept at Mechanicville, Fort Edward and Corinth, from which the discharge is determined.

HUDSON RIVER BELOW STATE DAM, TROY, N. Y.

This gage was established January 19, 1903, by E. A. Lamb. The present gage is vertical and is in two sections. The lower section, reading from zero to 13 feet, is attached to the face of the wall of the sloop lock at the left-hand, or Troy end of the dam. The upper section, reading from 13 to 21 feet, is painted on the down-stream end of the same wall. The gages are below the lower miter gates and are on the side of the lock adjoining the timber crib forming the dam abutment. A third section, reading from 20 to 24 feet, is attached to the southwest corner of Orr & Co.'s paper mill. The gages at the State dam at Troy are maintained in coöperation with the U. S. Weather Bureau. The readings are taken each morning and afternoon by John B. Mackey. The zero mark of the gage below the dam is at elevation 0.084. The gages are referred to a bench-mark consisting of a copper plug in the top of the lock wall between the anchors of the southwest gate. Elevation of the bench-mark is 21.564, Weather Bureau datum.

The water level is affected both by tides and by the flow in the river.

Mean Daily Elevation of Water-surface (Weather Bureau Datum) of Hudson River below State Dam at Troy, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1.83	5.63	9.28	8.18	8.98	4.83	3.83	3.33	3.18	3.33	2.53	*a*
2	2.08	6.23	8.33	8.83	9.83	4.53	3.43	2.33	3.43	3.18	2.28	*a*
3	2.28	6.83	7.68	9.18	12.08	5.28	3.33	2.13	3.08	3.33	2.68	*a*
4	2.33	7.58	6.33	8.83	12.93	5.23	1.93	2.43	3.28	3.03	2.78	*a*
5	2.93	7.33	5.18	8.93	11.83	4.83	2.73	2.63	3.43	3.08	2.73	*a*
6	3.03	9.08	5.68	11.43	12.18	3.68	2.33	2.78	3.68	2.83	2.83	*a*
7	6.58	10.83	5.68	14.58	11.93	4.13	2.83	3.28	3.18	2.68	2.38	*a*
8	7.08	10.23	5.28	16.83	11.73	4.13	2.38	2.83	2.53	2.58	1.93	*a*
9	6.53	9.58	5.43	15.18	10.68	4.23	2.53	3.18	2.93	2.53	2.68	*a*
10	6.33	8.53	5.18	14.83	10.18	3.83	2.68	3.43	2.63	2.33	2.68	*a*
11	5.83	8.08	5.18	8.93	9.58	4.08	3.38	3.43	3.33	2.18	2.43	*a*
12	5.53	7.73	5.38	9.33	11.08	4.28	2.78	2.78	2.83	3.28	2.98	2.83
13	5.18	7.33	5.18	8.83	11.83	3.73	2.93	2.68	2.68	3.58	2.48	3.53
14	5.08	7.08	5.38	11.28	10.03	3.93	2.93	2.78	2.08	3.08	2.58	3.18
15	5.03	7.78	5.08	15.88	9.38	4.03	3.43	3.38	2.58	2.33	3.08	2.53
16	4.93	8.13	4.93	17.83	9.23	3.78	3.78	3.48	2.63	2.53	2.58	2.93
17	5.03	8.63	5.38	16.83	9.33	3.93	3.83	3.38	2.68	2.33	2.58	3.33
18	4.83	8.43	5.23	14.58	9.43	4.03	3.23	3.53	2.83	2.83	2.28	3.03
19	4.18	8.48	4.78	14.03	9.33	4.13	3.03	3.33	3.08	2.98	2.88	2.58
20	3.83	14.98	4.88	13.83	7.93	4.08	2.83	4.18	2.58	2.28	3.08	2.08
21	3.53	19.58	4.83	12.83	8.38	4.43	2.93	4.98	3.58	2.58	2.28	2.33
22	3.93	12.83	5.33	13.18	7.93	4.83	3.08	2.33	3.83	2.43	2.58	2.43
23	4.08	11.38	5.38	12.83	7.68	4.13	2.98	2.43	3.33	2.28	2.63	1.93
24	5.03	11.68	5.33	11.93	6.83	3.33	3.18	1.98	2.58	2.28	1.93	2.43
25	9.93	11.23	6.38	11.03	5.33	3.18	3.18	2.53	2.83	2.58	2.63	1.98
26	11.38	11.23	7.03	9.38	5.18	3.43	3.53	2.83	2.58	2.48	2.68	1.83
27	10.73	11.08	7.33	9.08	4.53	3.63	3.73	2.93	2.83	2.68	2.68	2.03
28	9.63	10.33	8.83	8.93	5.08	3.33	3.43	2.43	2.68	2.93	2.28	1.78
29	8.98	......	8.83	8.78	4.33	3.53	3.33	2.83	2.38	2.78	2.53	1.78
30	8.08	......	8.33	8.83	4.88	4.58	2.93	2.68	2.58	2.68	2.68	1.83
31	7.18	......	8.13	......	4.78	......	3.18	2.83	......	2.33	......	1.33

a No record.

HUDSON RIVER ABOVE STATE DAM, TROY, N. Y.

This gage was established November 15, 1904, by C. A. Poole, and it is in two sections. The lower portion, reading from 3 to 12 feet, is attached to the timber crib forming the left-hand abutment of the dam. The gage is just up-stream from the sloop lock on the canal side of the crib. The upper section of the gage, reading from 12 to 16 feet, is attached to a tree growing on the earth filling of the timber crib. Elevation of water-surface, when the gage reads zero, equals 9.444, Weather Bureau datum. The water-level is affected both by the volume of flow and by the use of water in the adjoining mills.

Mean Daily Elevation of Water-surface (Weather Bureau Datum) of Hudson River above State Dam at Troy, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.a
1909.												
1	14.94	15.74	16.39	16.64	16.69	14.49	13.94	13.59	13.44	14.04	14.54	......
2	14.89	14.69	16.14	16.84	17.19	14.54	13.94	13.39	13.34	14.54	14.44	......
3	14.84	15.19	15.94	17.04	18.04	14.74	13.94	13.39	13.39	15.04	14.39	......
4	14.94	15.69	15.89	17.04	18.14	14.84	13.94	13.44	13.39	14.94	14.44	......
5	15.04	16.54	15.84	17.04	17.94	14.84	13.89	13.34	13.74	14.89	14.44	......
6	15.19	16.64	15.64	18.09	17.94	14.54	13.94	13.39	14.24	14.99	14.44	......
7	15.89	16.89	15.04	19.44	17.89	14.59	13.89	13.39	14.34	14.84	14.44	......
8	16.64	16.84	14.69	20.44	18.14	14.39	13.84	13.44	14.44	14.79	14.74	......
9	16.19	16.74	14.39	19.84	17.64	14.34	13.79	13.39	14.34	14.84	15.04	......
10	15.84	16.74	14.44	19.64	17.19	14.29	13.74	13.24	14.39	14.39	15.14	......
11	15.74	16.69	14.39	17.04	17.19	14.24	13.39	13.29	14.44	13.84	15.14	......
12	15.64	16.64	14.34	17.04	17.79	14.24	13.44	13.24	14.74	13.69	15.24	......
13	15.54	16.44	14.49	17.54	18.19	14.24	13.29	13.24	14.84	13.29	15.19	......
14	15.44	16.44	14.69	18.69	17.49	14.29	13.34	13.24	15.04	13.39	15.14	......
15	15.39	15.49	14.74	20.34	16.99	14.34	13.24	13.44	14.94	13.44	14.99	......
16	15.34	15.89	14.74	21.14	17.04	14.44	13.44	13.44	14.99	13.44	14.94	......
17	15.44	15.54	14.94	19.94	16.99	14.39	13.34	13.44	14.94	13.79	14.89	......
18	15.39	15.39	14.99	19.24	16.94	14.39	13.39	13.59	14.89	13.94	14.84	......
19	15.34	15.24	14.94	19.04	16.49	14.34	13.34	14.09	14.64	14.04	14.89	......
20	15.14	18.19	14.94	18.69	16.09	14.39	13.49	14.14	14.44	14.34	14.94	......
21	14.94	20.54	14.74	18.44	15.99	14.49	13.44	14.14	13.94	14.19	14.89	......
22	15.04	17.69	14.89	18.44	15.94	14.44	13.44	13.74	13.59	14.24	14.84	......
23	15.39	16.94	14.94	18.34	15.89	14.34	13.69	13.74	13.84	14.34	14.79	......
24	14.89	16.89	14.94	18.34	15.84	14.29	13.84	13.59	13.84	14.44	14.74	......
25	17.19	16.84	15.24	17.69	15.44	14.24	13.79	13.44	13.94	14.49	14.84	......
26	16.89	16.74	15.94	17.09	15.29	14.19	13.84	13.44	13.94	14.54	14.84	......
27	16.59	16.54	16.04	16.94	15.24	14.19	13.94	13.34	13.99	14.59	14.89	......
28	16.19	16.44	16.84	16.99	14.99	14.14	13.89	13.39	13.94	14.64	14.94	......
29	16.09	......	16.84	16.94	14.84	14.09	13.89	13.34	14.04	14.64	14.89	......
30	15.44	......	16.79	16.64	14.54	13.94	13.84	13.39	14.04	14.54	14.94	......
31	15.19	......	16.64	......	14.49	......	13.74	13.34	......	14.54	......	......

a No record.

HUDSON RIVER AT WATERFORD, N. Y.

Mean Daily Gage Height, in Feet, of Hudson River at Waterford, N. Y.b

DAY.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.								
1	......	15.70	13.80	13.70	13.70	13.10	14.10	14.95
2	......	15.85	13.80	13.80	13.65	13.60	14.10	15.15
3	*a*	15.50	13.80	13.85	13.60	13.95	14.00	15.20
4	*a*	15.35	13.80	13.90	13.50	13.90	13.85	15.05
5	*a*	15.15	13.70	14.00	13.65	13.75	13.80	14.90
6	*a*	14.95	13.80	14.20	13.85	13.80	13.80	14.90
7	*a*	14.80	13.80	14.05	13.70	13.70	13.65	15.00
8	*a*	14.70	13.85	14.00	13.65	13.60	14.00	15.00
9	*a*	14.55	13.85	14.00	13.50	13.45	13.80	15.00
10	18.85	14.50	13.80	13.90	13.35	13.30	13.80	15.10
11	18.40	14.35	13.80	13.90	13.15	13.60	13.80	15.20
12	17.55	14.45	13.70	13.80	13.10	13.50	13.80	15.10
13	17.20	14.25	13.70	13.80	13.70	13.50	13.80	15.00
14	17.30	14.05	13.70	13.85	13.70	13.60	13.80	15.00
15	17.15	14.05	13.65	13.90	13.60	13.60	14.00	15.00
16	17.10	14.50	13.55	13.80	13.50	13.50	13.90	15.00
17	17.05	14.50	13.55	13.80	13.40	13.50	13.80	15.00
18	16.90	14.40	13.75	13.80	13.30	13.80	13.80	15.10
19	16.50	14.30	13.85	14.10	13.20	13.50	14.00	15.10
20	16.10	14.10	14.10	14.05	13.70	13.40	13.85	15.05
21	16.05	13.90	14.35	13.85	13.50	13.30	13.95	15.05
22	16.00	14.00	14.40	13.80	13.15	13.20	14.20	15.20
23	16.15	14.15	14.30	13.80	13.10	13.10	14.50	15.30
24	16.35	14.25	14.30	13.70	13.10	13.10	14.90	15.30
25	16.25	14.15	14.20	13.55	13.10	13.50	15.00	15.30
26	15.80	14.00	14.10	13.60	13.10	13.55	15.15	15.30
27	15.85	13.85	14.00	13.50	13.40	13.70	15.30	......
28	15.75	13.80	13.90	13.60	13.25	13.85	15.30	......
29	15.55	13.80	13.90	13.60	13.35	14.00	15.80	......
30	15.50	13.80	13.80	13.70	13.20	14.00	15.00	......
31	15.50	......	13.80	13.70	......	14.00	......	......

a No Record.

b For record, Jan. 1 to May 9, inclusive, and Dec. 27 to 31, inclusive, and for description, see Mohawk river at Waterford, page 440.

Mean Daily Gage Height, in Feet, of Hudson River at Waterford, N. Y.[a]

DAY.	June.	July.
1909.		
1	......	13.75
2	......	13.70
3	......	13.60
4	......	13.35
5	......	13.70
6	14.20	13.95
7	15.40	13.85
8	15.55	13.75
9	15.25	13.60
10	14.85	13.60
11	14.70	......
12	15.30	......
13	*a*	......
14	15.20	......
15	15.20	......
16	14.90	......
17	14.85	......
18	14.80	......
19	14.80	......
20	15.40	......
21	15.20	......
22	14.90	......
23	14.75	......
24	14.50	......
25	14.30	......
26	14.20	......
27	14.10	......
28	14.00	......
29	13.95	......
30	13.85	......
31	......	......

[a] For record, Jan. 1, to June 5, inclusive, and July 11 to Dec. 31, inclusive, see Hudson river at Waterford, page 441.

HUDSON RIVER BELOW DAM OF HUDSON RIVER POWER CO., TWO MILES BELOW MECHANICVILLE, N. Y.

This gage is located on the right-hand bank of Hudson river about one-quarter mile down-stream from the dam of the Hudson River Power Co. A vertical staff gage divided decimally from zero to 16 feet is placed within a square wooden well-curb on the stream bank. The interior of the well communicates freely with the water in the river by means of a buried pipe. The gage was established August 18, 1905, by this Department, and readings are taken at 8 A. M. and 5 P. M. each day by H. C. Tinker. The zero mark of the gage is at elevation 29.00.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River below Hudson River Power Co.'s Dam near Mechanicville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	30.35	31.30	34.15	33.00	34.40	31.65	30.70	30.20	30.35	30.40	30.40	30.55
2	30.30	31.45	33.45	33.05	34.65	31.50	30.65	30.15	30.30	30.40	30.40	30.60
3	30.15	31.20	33.25	33.20	35.00	31.35	30.60	30.20	30.50	30.35	30.35	30.45
4	30.35	31.10	32.90	32.75	35.35	31.30	29.00	30.35	30.60	30.50	30.30	30.40
5	30.50	31.05	32.55	33.60	35.25	31.05	30.30	30.40	30.25	30.50	30.40	30.35
6	32.70	31.90	32.20	33.80	34.90	31.05	31.25	30.25	30.45	30.25	30.40	30.40
7	32.50	32.10	32.10	35.00	34.65	32.10	30.85	30.25	30.35	30.50	30.25	30.50
8	32.30	32.15	32.10	36.70	34.70	32.15	30.55	30.15	30.30	30.35	30.30	30.65
9	32.15	32.15	31.90	36.95	35.00	31.95	30.80	30.40	30.35	30.35	30.30	30.45
10	31.85	31.70	31.60	36.95	34.65	31.70	30.60	30.45	30.40	30.10	30.45	30.40
11	31.50	32.10	32.80	35.70	35.00	31.70	30.60	30.25	30.40	30.10	30.30	30.30
12	31.00	31.95	32.50	35.10	35.65	32.20	30.25	30.40	30.40	30.25	30.35	30.05
13	31.60	31.95	31.90	35.10	36.30	32.20	30.40	30.25	30.40	30.20	30.35	30.55
14	30.95	31.30	31.55	34.90	35.35	32.20	30.35	30.30	30.30	30.35	30.40	30.40
15	30.75	31.45	31.90	37.75	35.15	31.75	30.30	30.20	30.30	30.40	30.45	30.50
16	31.05	31.95	31.95	38.60	34.00	31.55	30.50	30.30	30.35	30.30	30.50	30.55
17	30.85	32.05	31.50	38.45	34.10	31.35	30.40	30.40	30.30	30.25	30.30	30.40
18	31.20	32.05	31.40	37.70	34.30	31.35	30.30	30.50	30.35	30.30	30.25	30.40
19	30.85	32.10	31.30	36.90	34.20	31.65	29.65	30.65	30.25	30.50	30.30	30.15
20	31.00	36.40	31.50	36.90	33.95	31.70	30.40	30.55	30.30	30.50	30.35	30.40
21	31.00	35.60	31.00	37.15	33.70	31.90	30.35	30.60	30.35	30.50	30.40	30.40
22	30.75	34.80	31.45	36.85	33.35	31.25	30.40	30.30	30.25	30.40	30.40	30.40
23	30.75	34.30	31.40	36.30	33.25	31.05	30.60	30.35	30.20	30.55	30.55	30.45
24	30.35	34.30	31.50	36.10	33.25	31.10	30.35	30.50	30.30	30.30	30.40	30.40
25	32.70	36.25	32.15	35.25	32.80	31.05	30.25	30.45	30.40	30.10	30.35	30.30
26	32.75	35.10	33.40	35.10	32.70	30.90	30.30	30.40	30.40	29.60	30.35	30.20
27	32.80	34.60	33.15	34.65	32.50	31.20	30.30	30.30	30.40	30.35	30.50	30.40
28	32.65	36.20	33.20	34.20	32.05	30.45	30.45	30.30	30.35	30.45	30.40	30.35
29	32.15	......	33.60	34.45	32.00	30.65	30.50	30.05	30.40	30.50	30.40	30.45
30	31.70	.....	33.10	34.10	32.05	30.50	30.50	30.30	30.45	30.30	30.60	30.30
31	31.40	......	32.70	......	32.40	......	30.25	30.35	......	30.30	......	30.45

HUDSON RIVER ABOVE DAM OF HUDSON RIVER POWER CO., TWO MILES BELOW MECHANICVILLE, N. Y.

This gage was established August 18, 1905, by this Department. The gage is a vertical staff divided to feet and tenths and reading from zero to 16 feet. It is attached to the up-stream face of the river wall at the right-hand end of the line of waste-gates forming a continuation of the dam. Readings are taken at 8 A. M. and 5 P. M. by H. C. Tinker. The gage zero is at elevation 43.00. A record is kept in the adjoining power-plant, showing the use of water by the turbine wheels, and also the waste over the dam, through gates, etc.

The accompanying tables show the discharge as calculated at the power plant. The dam is of the ogee type, but the discharge is calculated by the East Indian Engineers' formula for dams with broad crest.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River above Hudson River Power Co.'s Dam near Mechanicville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	49.15	48.95	50.10	49.35	50.65	49.05	48.75	48.90	49.00	46.95	48.85	49.25
2	49.25	49.25	49.65	49.40	51.15	49.00	47.90	49.40	48.70	46.60	48.70	49.25
3	49.05	49.35	49.65	49.45	51.05	48.95	47.95	49.05	49.10	46.95	48.45	49.00
4	49.20	49.15	49.55	49.90	51.35	48.80	47.75	49.30	48.25	47.30	49.00	48.90
5	49.30	49.10	49.50	49.65	51.25	48.95	47.70	49.05	47.90	46.95	48.95	48.75
6	49.65	49.60	49.45	49.95	51.15	49.35	48.35	49.10	47.95	47.30	48.70	49.10
7	49.60	49.25	49.30	50.80	50.75	49.40	48.00	49.15	48.05	47.05	49.05	49.20
8	48.90	49.20	49.45	51.90	50.95	49.45	47.40	48.80	47.65	47.30	49.20	49.20
9	49.20	49.50	49.40	52.40	51.40	49.30	47.95	49.25	47.40	47.05	49.20	48.85
10	48.10	49.35	49.20	52.10	50.75	48.95	48.15	49.20	47.50	47.35	49.15	49.15
11	48.30	49.35	49.70	51.35	51.10	48.85	48.70	49.30	47.30	47.25	49.00	49.00
12	49.00	49.25	49.30	50.80	51.40	49.55	48.90	48.90	47.65	46.85	49.40	47.95
13	49.15	49.25	49.20	50.35	51.90	49.45	49.05	49.30	47.50	46.75	49.20	49.05
14	49.15	49.30	49.10	51.05	51.05	49.15	49.15	49.15	47.20	47.05	48.65	48.95
15	49.40	49.05	49.25	52.95	50.80	49.15	49.00	48.90	47.40	46.85	49.20	49.05
16	49.20	49.20	49.20	53.60	50.60	49.05	48.15	49.30	47.25	47.00	49.20	48.95
17	49.25	49.20	49.05	53.50	50.35	49.60	48.40	49.00	47.75	47.75	48.75	49.10
18	49.30	49.25	49.00	53.40	50.25	48.85	48.20	49.15	48.15	48.70	49.00	49.10
19	49.35	49.35	49.00	52.60	50.30	49.00	48.40	48.95	47.90	47.40	49.00	49.10
20	48.95	53.63	48.90	52.40	50.00	49.65	48.55	49.40	47.85	48.85	49.20	49.05
21	49.10	51.75	49.05	52.35	49.90	49.25	49.00	49.15	47.80	48.75	48.50	48.80
22	49.10	50.60	49.10	52.45	49.65	48.50	49.30	48.50	47.95	48.20	48.30	48.90
23	49.15	50.20	49.00	51.80	50.10	48.50	48.70	48.95	47.60	48.45	49.20	48.90
24	49.35	50.20	49.10	51.60	49.35	48.20	49.00	49.15	47.40	48.80	49.25	49.10
25	49.15	51.80	49.50	51.40	49.50	48.15	49.15	48.75	47.25	48.55	48.90	48.85
26	49.25	51.35	49.70	50.90	49.75	48.35	48.75	48.80	47.00	48.60	49.25	48.35
27	48.55	50.50	49.40	50.70	49.55	48.80	49.30	48.80	47.05	49.35	49.30	49.05
28	48.80	50.20	50.00	50.40	49.30	48.05	49.10	49.20	47.15	49.20	49.10	48.95
29	49.50	......	49.65	50.60	49.40	48.15	49.25	48.90	46.80	49.10	49.25	48.95
30	49.35	......	49.10	50.30	50.00	48.05	49.10	49.05	47.15	48.50	49.25	49.10
31	49.45	......	49.30	......	50.10	......	49.25	49.10	......	49.25	......	49.10

Mean Daily Discharge, Second-feet, of Hudson River at Hudson River Power Co.'s Dam near Mechanicville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
1909.									
1	1,717	6,139	19,050	15,369	21,607	7,380	3,190	790	1,259
2	1,613	5,564	15,987	14,410	21,977	7,328	3,380	1,808	1,377
3	839	5,116	14,517	15,825	23,970	6,332	3,013	902	1,727
4	1,714	4,840	13,444	15,818	25,351	6,566	1,948	1,693	2,112
5	2,641	4,603	11,799	18,448	25,001	5,719	1,911	2,139	778
6	13,187	1,150	9,759	19,809	24,362	5,822	3,960	905	1,651
7	8,968	10,384	7,878	25,393	21,823	8,292	3,330	1,346	1,216
8	6,777	9,707	7,919	34,007	22,908	8,362	2,359	342	1,513
9	4,740	9,096	7,297	36,662	23,626	7,461	2,950	1,712	1,666
10	8,020	7,583	6,638	33,759	22,741	7,259	2,744	2,053	1,728
11	8,780	9,216	10,850	27,703	25,086	6,978	1,884	1,718	1,920
12	5,355	8,146	10,355	25,509	27,409	8,334	1,689	2,130	1,256
13	5,320	8,744	6,000	22,750	31,138	5,987	1,999	1,376	1,623
14	4,004	8,074	7,760	27,752	24,547	7,867	2,103	1,248	1,497
15	4,075	8,559	8,743	40,668	22,266	7,460	1,658	454	1,617
16	2,993	9,350	8,519	46,458	18,759	7,006	2,156	1,378	1,673
17	2,930	8,917	7,349	45,568	20,246	6,144	1,753	1,822	1,466
18	3,435	8,909	6,048	41,041	19,260	6,471	1,318	2,615	1,707
19	3,400	7,875	6,233	37,339	19,203	7,093	897	3,030	856
20	2,990	43,083	6,789	34,987	17,957	7,246	1,767	2,938	1,614
21	2,998	28,341	5,166	35,346	16,351	7,875	2,257	3,000	1,270
22	3,129	21,979	7,001	34,131	15,506	5,401	2,616	912	1,172
23	3,126	20,515	6,598	30,772	14,984	5,352	2,540	2,758	1,491
24	4,011	20,913	6,517	29,086	13,621	4,960	2,163	2,440	2,020
25	11,886	30,890	9,122	23,834	12,228	4,660	1,259	2,074	1,690
26	11,476	26,778	15,582	22,511	10,297	4,408	1,745	1,492	......
27	10,868	21,056	13,537	21,789	9,138	3,659	3,100	1,348	......
28	10,575	19,230	14,373	20,041	8,587	4,523	2,116	1,236	......
29	8,957	......	16,194	21,137	8,238	4,620	2,331	24	......
30	9,837	......	15,129	19,419	8,946	3,155	2,111	1,246	......
31	8,292	......	14,295	......	9,709	......	1,364	1,357	......

HUDSON RIVER AT TOLL BRIDGE, MECHANICVILLE, N. Y.

A gage was established at River street bridge, Mechanicville, August 16, 1905, for this Department. A vertical gage, reading from zero to 15.5 feet, is attached to the down-stream end of the first pier from the right-hand bank. Readings are taken by W. E. Downing at 8 A. M. and 5 P. M. The gage zero is at elevation 48.77. During low water the water-surface falls below the zero mark of the gage at times. The readings of the low stages of the stream are approximate only.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River at Toll Bridge Mechanicville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	49.42	50.82	51.92	50.77	52.12	49.97	48.82	49.02	48.97	48.47	49.02	49.42
2	49.07	50.67	51.32	50.72	52.42	49.87	48.77	49.12	49.07	48.37	49.12	49.32
3	48.92	50.37	51.12	50.87	52.02	49.82	48.82	49.02	49.32	48.32	48.82	49.17
4	49.22	49.92	50.97	51.07	52.82	49.52	48.47	48.97	48.97	48.72	49.22	49.12
5	49.62	49.87	51.02	51.27	52.02	49.62	48.37	49.07	48.47	48.32	49.17	48.82
6	50.82	51.02	50.77	51.52	52.57	49.82	48.52	49.07	48.52	48.32	48.92	49.12
7	50.32	51.02	50.22	52.52	52.22	50.32	48.82	49.02	48.37	48.42	49.37	49.37
8	50.77	50.87	50.47	53.97	52.47	50.32	48.62	48.77	48.37	48.27	49.62	49.42
9	50.07	50.97	50.32	54.17	52.67	50.22	48.87	49.27	48.37	48.32	49.32	49.22
10	49.32	50.92	50.77	53.82	72.27	49.97	48.57	49.12	48.52	48.07	49.32	49.42
11	49.72	51.07	50.42	53.17	52.67	49.82	48.82	49.27	48.52	48.07	49.27	49.32
12	49.77	50.87	50.17	52.52	53.12	50.32	49.07	49.12	48.22	48.17	49.32	47.97
13	49.57	50.67	50.02	52.27	53.42	49.87	49.12	49.22	48.47	48.12	49.32	49.62
14	49.42	50.42	49.87	52.87	52.57	50.12	49.22	49.22	48.37	48.17	48.87	49.27
15	50.02	50.62	50.12	53.87	52.32	50.07	49.12	49.17	48.42	48.02	49.47	49.42
16	49.02	50.97	50.02	55.47	51.77	50.02	48.57	49.22	48.52	48.12	49.27	49.22
17	48.62	50.97	49.72	55.32	51.77	49.57	48.62	48.92	48.42	48.37	48.77	49.32
18	49.22	50.82	49.72	55.12	51.82	49.77	48.22	49.52	48.47	49.02	49.07	49.12
19	49.92	50.92	49.62	54.47	51.82	49.87	48.72	49.42	48.22	48.37	49.12	49.12
20	49.82	54.72	49.47	54.32	51.52	50.27	48.62	49.62	48.42	49.27	49.37	49.22
21	49.87	53.52	49.27	54.37	51.37	50.17	49.12	49.57	48.02	49.47	48.97	49.07
22	49.72	52.57	49.92	54.12	51.17	49.62	49.42	48.82	48.12	48.92	49.22	48.92
23	49.82	51.92	49.72	53.72	51.17	49.32	49.07	49.12	48.27	48.82	49.72	48.87
24	49.57	53.52	49.87	53.37	50.92	49.17	49.22	49.42	48.27	49.07	49.32	48.97
25	51.47	54.52	50.47	52.77	51.12	49.12	49.47	49.07	48.32	48.87	49.07	48.52
26	51.27	52.62	51.22	52.52	50.67	49.07	48.82	49.07	47.97	48.77	49.47	48.47
27	50.97	52.02	50.92	52.22	50.32	49.02	49.52	48.87	48.02	49.67	49.37	49.32
28	50.82	51.67	50.97	51.92	50.22	49.02	49.17	49.22	48.17	49.42	49.27	49.32
29	50.77	......	51.22	52.17	50.22	48.92	49.27	48.67	48.37	49.37	49.62	49.37
30	50.87	......	50.67	51.97	50.37	48.82	49.27	49.42	48.52	48.57	49.42	49.17
31	50.37	......	50.57	......	50.87	......	49.17	49.52	......	49.67	......	49.17

HUDSON RIVER AT WEST VIRGINIA PULP AND PAPER CO.'S MILL, MECHANICVILLE, N. Y.

A record of the flow of Hudson river at Mechanicville has been kept at the Duncan dam since December, 1888. The record includes two daily readings of the depth on the crest of the dam, and a continuous record of the run of the water-wheels in the adjoining paper-mill. The accompanying tables, computed by Mr. R. P. Bloss, the engineer of the West Virginia Pulp and

Paper Company, show the daily and monthly mean flow at Mechanicville.

The dam at Mechanicville was raised during 1904, a concrete crest and apron being added, so that the dam has now a rounded, or ogee cross-section. A discharge curve has been calculated, using coefficients of discharge derived from United States Geological Survey experiments on models of dams of ogee cross-section.

Water carried in Champlain canal, which parallels Hudson river from Fort Edward to Albany, is not included in the estimated discharge.

Mean Daily Discharge, Second-feet, of Hudson River at West Virgina Pulp and Paper Co.'s Mill, Mechanicville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
1909.									
1	1,874	6,879	15,672	11,867	18,524	7,243	2,389	1,404	1,379
2	1,589	5,690	12,458	11,485	21,185	6,618	2,293	1,783	1,578
3	1,836	4,790	12,654	12,216	21,493	5,598	2,327	1,010	1,736
4	1,887	4,436	11,452	13,753	22,566	5,362	2,682	1,463	1,665
5	1,700	3,973	10,068	14,326	23,523	5,540	2,031	1,759	674
6	10,054	6,611	8,867	15,778	21,770	6,894	2,941	1,245	1,187
7	10,269	8,057	8,017	20,423	19,817	9,564	2,401	1,213	2,140
8	8,098	8,443	8,001	30,501	19,617	8,331	2,399	612	1,473
9	6,566	7,471	6,740	34,889	23,252	7,436	1,824	1,318	1,476
10	7,084	6,652	6,465	31,515	18,708	7,016	......	1,115	1,476
11	6,462	7,555	10,752	28,234	21,082	6,509	1,492	1,731	1,684
12	4,705	6,994	9,871	22,471	24,749	8,436	1,781	1,526	1,501
13	4,561	7,368	8,273	19,659	28,154	6,801	1,785	933	1,524
14	3,823	6,386	8,167	20,410	22,696	7,747	1,764	1,077	1,548
15	4,028	7,518	6,484	37,324	20,490	6,520	1,688	740	1,579
16	1,968	8,147	7,573	46,299	17,031	6,136	1,683	1,819	1,473
17	3,506	7,445	7,490	44,847	17,511	5,126	1,859	1,769	1,515
18	3,239	7,566	6,420	40,771	17,104	5,814	569	1,344	1,653
19	2,412	......	6,106	36,910	16,996	6,396	1,481	2,189	430
20	2,326	27,591	6,144	34,091	15,656	8,109	1,481	3,209	1,482
21	2,347	24,515	6,293	37,736	14,777	7,093	2,109	2,704	1,482
22	3,296	20,683	6,262	33,665	13,370	5,292	1,814	1,032	883
23	1,995	18,376	5,641	29,977	13,150	4,941	1,801	2,573	1,517
24	6,328	16,719	7,013	27,855	10,039	4,075	1,935	2,146	1,697
25	10,244	29,655	7,849	......	12,609	4,069	1,712	1,807	1,738
26	9,634	22,897	13,483	21,187	9,469	3,748	1,809	1,717	742
27	9,421	19,865	12,488	19,146	8,373	4,647	3,387	1,774	1,702
28	8,990	16,346	13,784	17,202	7,747	3,914	1,779	1,479	......
29	8,155	......	14,215	18,917	7,231	3,270	1,752	235	......
30	6,956	......	11,875	17,080	8,784	2,496	1,206	1,027	......
31	6,104	......	11,049	......	9,298	......	1,222	1,126	......

Hudson River at B. & M. R. R. Bridge above Mechanicville, N. Y.

This gage was established August 15, 1905, by this Department. The gage consists of a vertical board with painted tenth-foot marks reading from zero to 16 feet, and is attached to the down-stream end of the right-hand pier of the bridge. The gage datum is at elevation 66.50, and the gage is slightly inclined to conform with the batter of the pier. Readings are taken at 7 A. M. and 5 P. M. by W. B. Lebar. The gage is located about two-thirds mile up-stream from the Duncan dam.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River at B. & M. R. R. Bridge above Mechanicville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	66.15	68.65	70.40	69.75	70.80	68.90	68.00	66.70	67.20	67.70	67.10	67.30
2	66.05	69.05	70.00	69.60	71.25	68.75	68.65	66.85	66.85	67.45	66.70	67.05
3	65.65	68.55	69.90	69.90	71.15	68.50	68.60	66.15	66.90	67.35	67.05	67.20
4	65.60	68.50	69.65	70.35	71.30	68.60	67.70	67.35	66.60	67.80	65.20	67.00
5	67.05	68.05	69.55	69.95	71.15	68.50	68.10	66.35	66.65	67.25	64.70	68.50
6	69.80	68.75	69.15	70.45	71.05	69.25	68.00	65.90	67.95	67.25	66.60	67.00
7	69.65	69.75	69.55	71.20	70.70	69.55	66.75	67.80	66.60	67.40	65.65	67.50
8	69.05	69.10	69.10	72.15	70.85	69.30	66.60	67.55	67.00	66.80	65.85	67.40
9	68.60	69.25	69.15	72.40	71.30	69.10	67.20	67.50	66.95	67.35	67.00	66.75
10	69.25	68.95	69.25	71.90	71.00	68.90	68.00	67.85	67.20	67.50	67.40	66.90
11	68.65	69.35	69.60	71.85	71.15	68.85	68.40	67.75	67.30	67.60	66.65	67.60
12	68.35	69.00	69.30	71.40	71.50	69.30	67.80	66.35	66.85	66.45	66.65	67.20
13	68.20	69.10	69.15	70.95	71.70	69.35	67.10	66.75	67.05	66.90	66.85	67.10
14	67.85	69.55	69.35	71.10	71.15	69.20	66.95	67.50	67.10	66.75	66.05	66.00
15	66.80	69.45	68.95	73.00	70.90	69.10	67.80	67.45	67.00	66.80	66.40	65.95
16	65.40	69.15	68.95	73.50	70.70	68.90	67.60	67.75	67.05	67.30	65.75	65.75
17	68.40	69.25	68.75	73.25	70.50	68.60	67.25	65.70	67.25	66.40	64.90	65.80
18	68.10	69.35	68.65	73.20	70.40	68.65	65.10	67.85	67.25	66.55	64.80	66.10
19	67.85	69.40	68.50	72.80	70.40	68.95	66.75	67.80	67.55	66.25	66.80	66.10
20	66.90	72.65	68.70	72.50	70.05	69.60	66.30	67.25	67.25	67.25	66.95	66.45
21	67.80	72.40	69.20	72.50	69.90	69.35	67.60	67.25	66.40	66.85	66.95	65.60
22	67.60	71.35	68.80	72.25	69.95	68.85	67.60	67.50	67.50	66.65	66.80	67.00
23	67.70	70.85	68.85	72.05	70.25	68.60	67.40	67.60	66.95	66.85	67.30	67.30
24	68.85	71.10	69.00	71.75	70.10	68.35	67.30	67.60	66.85	67.35	66.65	66.85
25	69.60	72.20	69.35	71.50	69.50	68.35	67.55	66.95	66.60	66.50	66.10	66.35
26	69.55	71.40	70.20	70.95	69.35	68.05	67.35	65.80	65.60	66.20	66.25	67.30
27	69.50	70.95	69.90	70.90	69.10	68.75	67.95	67.05	66.95	67.10	66.20	66.20
28	69.35	70.95	70.20	70.60	68.95	68.20	67.05	66.40	67.10	67.30	68.45	65.85
29	69.10	......	70.15	70.60	69.10	68.35	67.70	66.35	66.40	67.10	67.70	66.40
30	69.05	......	69.75	70.45	69.60	68.20	66.50	66.60	68.10	67.20	67.55	66.30
31	69.20	......	69.65	......	69.20	......	67.00	65.90	......	67.40	......	65.90

HOOSIC RIVER.

DESCRIPTION.

Hoosic river has its sources on the west slope of the Hoosac mountains in Vermont and Massachusetts. Two head branches, one flowing southward, the other northward along the west slope of this range, unite at North Adams, Mass., and the stream then flows northwestward, entering the Hudson three miles north of Mechanicville. Above Buskirk the drainage basin is rugged and precipitous, the distribution of tributaries affording rapid concentration of the run-off from the steep rock slopes. The ridges are sparsely wooded. The soil in the valleys is generally firm and tenacious. The general elevation of the valley at the junction of the head waters is 1,000 feet. Numerous dams, affording power for textile, agricultural implement, and other industries, are scattered throughout the length of the stream from North Adams to Schaghticoke. The drainage basin contains no important lakes and but little storage in reservoirs.

HOOSIC RIVER AT BUSKIRK, N. Y.

A gaging station was established September 25, 1903, at the highway bridge in Buskirk village by Robert E. Horton, for the U. S. Geological Survey, by which it has since been maintained in coöperation with this Department. The channel is straight near the gaging station. The banks are high and seldom overflow. The current is exceptionally smooth, but is rather slow during low water. A standard chain gage is attached to the covered wooden highway bridge. The length of the chain is 28.17 feet. The gage is read twice each day by Bert C. Henry. A bench-mark is located on the up-stream corner of the left abutment; elevation, 36.03 feet above gage datum.

Meter measurements made during 1909 are given in the following table:

Current-meter Discharge Measurements of Hoosic River at Buskirk, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
		Feet.	*Feet.*	*Square feet.*	*Second-feet.*
1909.					
Jan. 22*....	D. M. Wood......................	2.91	126	462	419
Mar. 2......	D. M. Wood......................	2.94	129	513	1,080
Aug. 10.....	C. C. Covert......................	1.73	52	57	203

* Measurement made under ice conditions; average thickness of ice, 0.58 foot.

HOOSIC RIVER AT EAGLE BRIDGE, N. Y.

A gaging station was established on Hoosic river at Eagle Bridge, December 11, 1908, by this Department, it being intended to use this gage whenever possible to replace the former gaging record at Buskirk, which is now subject to backwater from the Schenectady Power Co.'s storage dam, recently constructed at Johnsonville.

The gage is of the box-and-chain type of standard form, the scale being subdivided to feet and tenths from 0 to 9 feet. It is attached to the outer side of the hand-railing of the bridge. The length of the chain from measuring rivet to end of weight is 25.86 feet.

Readings are taken at 7 A. M. and 6 P. M. each day by H. J. Speanburgh.

Meter measurements made during 1909 are given in the following table:

Mean Daily Gage Height, in Feet, of Hoosic River at Eagle Bridge, N. Y.

DAY.	Dec.
1908.	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	[a]1.10
12	1.50
13	1.25
14	1.10
15	1.05
16	1.18
17	1.25
18	1.45
19	1.25
20	0.90
21	0.90
22	0.95
23	1.10
24	1.30
25	1.05
26	1.40
27	1.15
28	0.80
29	1.35
30	1.25
31	1.10

[a] Gage established December 11, 1908.

Mean Daily Gage Height, in Feet, of Hoosic River at Eagle Bridge, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1.50	1.70	2.70	3.15	3.05	1.90	1.30	0.85	0.80	1.65	1.10	1.35
2	1.35	1.85	2.75	3.15	3.15	1.80	1.30	0.70	0.70	1.35	1.20	1.35
3	1.40	1.85	2.65	3.40	3.25	1.75	1.45	1.10	0.85	1.25	1.25	1.35
4	1.35	1.80	2.45	3.30	4.05	1.80	1.45	0.95	0.80	1.25	1.25	1.30
5	1.85	1.90	2.30	3.15	3.70	1.90	1.30	1.65	0.70	1.25	1.15	1.00
6	6.40	3.90	2.25	3.55	3.40	2.15	1.25	1.80	0.95	1.15	1.10	1.15
7	3.50	3.15	2.25	5.30	3.45	1.95	1.45	1.35	0.70	1.00	0.85	1.30
8	2.55	2.55	2.25	5.60	3.15	1.80	1.40	1.00	0 75	1.05	1.15	1.35
9	2.35	2.05	2.10	4.15	3.05	1.75	1.30	1.00	0.75	0.90	1.35	1.25
10	2.40	2.30	4.00	3.55	2.85	1.65	1.15	1.10	0.85	0.60	1.25	1.10
11	2.20	2.65	4.10	3.20	2.75	1.95	1.00	1.15	0.90	1.00	1.00	1.25
12	2.00	2.20	2.95	3.05	2.65	1.95	0.95	0.95	0.80	0.95	1.10	1.05
13	2.20	2.25	2.75	3.25	2.50	1.70	1.25	1.05	1.00	1.05	1.05	1.30
14	3.45	2.30	2.55	5.90	2.40	2.00	1.20	0.95	1.00	1.00	0.95	1.45
15	3.65	2.50	2 60	7.40	2.30	1.75	1.10	0.70	0.85	1.00	1.10	1.65
16	3.35	2.40	2.40	5.50	2.40	1.75	1.00	1.40	0.75	1.10	1.15	1.55
17	3.15	2.80	2.30	4.65	2.70	1.65	1.30	2.30	0.75	1.05	1.10	1.30
18	3.30	2 25	2.10	4.25	2.70	3.35	1.00	1.75	1.05	1.15	1.15	1.20
19	3.45	2.30	2.05	4.20	2.50	2 80	0.95	1.50	0.40	1.10	1.30	1.20
20	3.70	12 40	2.15	4.60	2.35	2.25	1.20	1.35	0.70	1.00	1.20	1.70
21	3 70	5.10	1.95	3.75	2.25	2.05	1.10	1.25	0.70	1.10	1.05	2.00
22	3.50	3.80	2.05	3.85	2.15	1.95	1.05	1.15	0.70	1.15	0.95	2.20
23	3.55	3.35	1.95	3.60	2.20	1.80	1.05	0.85	0.75	1.25	1.15	1.95
24	4.55	4.75	1.95	3.30	2.25	1.80	1.10	1.15	0.80	1.20	1.30	2.05
25	4.15	6.10	2.65	3.15	2.10	1.75	1.05	1.00	1.15	1.50	1.30	2.05
26	3.00	3.75	3.35	3.10	1.95	1.55	1.05	0.70	0.80	1.50	1.25	1.95
27	2.55	3.35	3.05	2.90	1.85	1.45	1.25	0.80	1.05	1.40	1.30	2.05
28	2.30	3.00	3.65	3.05	2.10	1.35	1.15	0.85	2.40	1.25	1.15	2.20
29	2.05	......	3.70	3.15	2.35	1.50	0.90	0.90	2.60	1.25	1.35	2.15
30	2.15	......	3.15	3.10	2.10	1.40	0.95	0.80	1.80	1.25	1.50	2.05
31	1.85	......	3.00	......	1.95	......	1.00	0.85	......	0.95	......	2.00

Current-meter Measurements of Hoosic River at Eagle Bridge, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
		Feet.	*Feet.*	*Square feet.*	*Second-feet.*
1909.					
July 5*a*	W. C. Hoyt	1 30	139	336	289
Aug. 27*b*	Covert and Hoyt	1.01	137	290	153

a Gage reader's reading at Buskirk for this day, 1.88.
b Gage reader's reading at Buskirk for this day, 6.20.

HOOSIC RIVER AT HOOSICK FALLS, N. Y.

This gage was established April 3, 1904, and is maintained by this Department in coöperation with the U. S. Weather Bureau. The gage, which is vertical, has two 5-foot steel sections and reads from − 5.0 to + 5.0 feet, and is attached to the partition wall of the head gate chamber of the factory of Walter A. Wood & Co. at the left-hand end of the dam, and a short distance upstream from the crest line. Readings are taken by Sanford L. Cluett at 7 A. M. and 5 P. M. each day. The zero mark of the gage is at elevation 410.04, B. & M. R. R. datum. It is referred to a copper plug at elevation 419.61, B. & M. R. R. datum, in the wall coping at the up-stream side of the head gate chamber. In low stages of the stream a large portion of the flow above this dam is diverted to the power-plant and there is no direct relation between the discharge and gage reading at such times.

Mean Daily Gage Height, in Feet, of Hoosic River at Hoosick Falls, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	0.10	0.25	0.60	0.80	1.00	0.30	−0.15	0.10	−1.65	−0.10	−0.15	0.10
2	0.05	0.30	0.60	0.75	1.10	0.20	−0.25	−1.95	−0.20	−0.70	0.00	−0.20
3	0.10	0.25	0.55	0.90	0.90	0.15	−0.05	−1.65	−0.20	−0.15	−0.20	−0.45
4	−0.20	0.30	0.50	0.85	1.25	0.15	0.20	−1.45	−0.35	−0.60	−0.10	−0.50
5	0.10	0.35	0.40	0.85	1.00	0.20	0.15	0.30	0.15	−0.05	−0.50	0.10
6	2.30	1.15	0.35	1.10	0.90	0.45	0.25	0.40	0.10	−0.40	0.15	−0.35
7	1.10	1.00	0.35	1.90	0.80	0.30	−0.05	0.05	0.15	−0.95	0.10	−0.15
8	0.75	0.65	0.35	2.10	0.75	0.20	−0.25	0.15	0.10	−0.60	−0.05	0.05
9	0.55	0.35	0.35	1.35	0.65	0.10	−0.45	−0.55	0.10	0.10	−0.40	−0.10
10	0.40	0.35	1.35	1.05	0.65	0.10	−0.15	−1.90	0.10	0.10	−0.20	0.05
11	0.35	0.90	1.20	0.85	0.65	0.25	0.10	−1.35	0.15	0.60	−0.60	0.10
12	0.60	0.60	0.85	0.90	0.70	0.25	−1.75	−1.10	0.20	0.10	−1.45	−0.20
13	0.10	0.40	0.85	0.90	0.50	0.30	−0.60	−1.35	0.20	−0.75	−0.10	−0.05
14	0.15	0.55	0.85	2.05	0.45	0.20	−0.90	−0.25	0.20	−0.50	0.10	0.20
15	0.20	0.65	0.60	2.75	0.40	0.15	−0.55	0.15	−0.50	−0.90	−0.45	0.20
16	0.10	0.60	0.50	1.95	0.45	0.20	−0.90	−1.95	−0.20	−0.55	−0.20	−0.10
17	0.20	0.45	0.45	1.45	0.55	−0.15	−0.80	0.15	−0.75	−0.95	−0.20	−0.20
18	0.10	0.40	0.35	1.35	0.60	0.90	0.15	0.45	−0.95	−0.60	−0.15	−0.55
19	0.10	0.45	0.25	1.20	0.50	0.75	−0.20	0.25	0.10	−0.40	−0.05	−0.20
20	0.05	3.85	0.35	1.40	0.50	0.55	−0.50	0.15	−0.85	0.05	0.00	0.05
21	0.05	1.70	0.35	1.00	0.40	0.45	−1.10	0.00	−0.95	−0.75	0.10	−0.55
22	0.15	1.05	0.30	0.95	0.40	0.35	−0.90	0.15	−1.35	−0.15	−0.05	−0.95
23	0.30	0.90	0.20	0.90	0.45	0.25	−0.70	−0.35	−1.55	−0.70	0.05	−0.60
24	1.45	1.55	0.20	0.90	0.40	0.25	−1.40	−0.75	−0.30	0.15	0.00	−0.95
25	1.20	2.20	0.55	0.85	0.35	0.15	0.15	−0.95	0.20	0.15	0.20	0.10
26	0.85	1.40	1.15	0.80	0.25	0.15	−1.20	−1.20	0.20	−0.15	0.10	0.10
27	0.55	1.10	0.80	0.70	0.25	0.15	−1.40	−0.50	0.45	−0.45	0.00	−0.95
28	0.35	0.75	0.90	0.90	0.25	0.05	−1.65	−1.70	0.65	−0.55	0.15	−1.20
29	0.35	......	1.05	0.85	0.50	−0.05	−1.95	0.15	0.75	0.10	0.10	−1.45
30	0.35	......	0.75	0.80	0.45	−0.10	−1.70	−0.20	0.35	0.10	0.10	−0.85
31	0.30	......	0.75	......	0.40	......	−0.65	−0.20	......	0.15	......	−1.20

Hudson River below Dam at Stillwater, N. Y.

A gaging station was established on the Hudson river below the dam at Stillwater, July 15, 1909, by A. T. Clark and J. M. Angus, for this Department. The gage consists of two 5-foot enameled steel sections, reading in feet and tenths from zero to 10 feet, and is fastened to a 10 x 10-inch square upright timber back of the grist-mill of A. T. Pack. The zero mark of the gage is at elevation 74.73, Barge canal datum. Readings are taken twice each day by Thos. E. Hickey.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River below Dam at Stillwater, N. Y.

DAY.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.						
1	......	75.73	75.73	75.88	75.68	75.93
2	......	75.63	75.73	75.83	75.83	75.93
3	......	75.73	75.88	75.78	75.73	76.03
4	......	75.88	75.93	75.88	75.73	75.93
5	......	75.73	75.83	75.88	75.68	75.83
6	......	75.73	75.73	75.93	75.63	75.83
7	......	75.63	75.63	75.83	75.63	75.83
8	......	75.68	75.63	75.78	75.73	75.83
9	......	75.63	75.83	75.73	75.73	75.83
10	......	75.73	75.83	75.73	75.83	75.83
11	......	75.73	75.93	75.73	75.83	75.73
12	......	75.73	75.83	75.73	75.78	75.63
13	......	75.73	75.78	75.63	75.73	75.68
14	......	75.73	75.83	*a*	75.63	75.83
15	......	75.68	75.68	*a*	75.73	76.03
16	75.63	75.73	75.78	*a*	75.73	75.88
17	75.58	75.83	75.83	*a*	75.68	75.83
18	75.58	75.93	75.78	*a*	75.63	75.73
19	75.58	75.93	75.83	*a*	75.68	75.63
20	75.68	76.03	75.78	*a*	75.73	75.63
21	75.73	76.13	75.68	75.63	75.73	75.63
22	75.93	76.03	75.68	75.68	75.73	75.63
23	76.03	76.03	75.68	75.63	75.83	75.63
24	75.93	75.98	75.73	75.63	75.73	75.63
25	75.88	75.93	75.88	75.63	75.73	75.53
26	75.83	75.88	75.78	75.68	75.73	75.53
27	75.98	75.93	75.73	75.78	75.83	75.58
28	75.88	75.83	75.68	75.83	75.88	75.88
29	75.88	75.73	75.78	75.78	75.93	75.78
30	75.98	75.68	75.83	75.73	75.93	75.63
31	75.83	75.63	......	75.63	......	75.63

a No record.

HUDSON RIVER AT HIGHWAY BRIDGE, STILLWATER, N. Y.

A gage was established at the highway bridge crossing the Hudson river at Stillwater and a record was begun December 28, 1907. Readings are taken each morning by Thomas E. Hickey. The gage is located a short distance above the dam and is also about one mile above the junction of Hoosic river with Hudson river.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River at Highway Bridge, Stillwater, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	84.69	84.69	86.34	85.79	86.69	85.14	84.14	83.94	84.54	85.19	84.44	85.49
2	84.69	84.54	86.04	85.79	86.84	85.04	84.09	83.79	84.74	85.24	84.49	85.49
3	84.59	84.49	85.79	85.84	86.94	84.94	84.09	83.74	85.04	85.09	84.39	85.59
4	84.59	84.84	85.74	85.94	87.19	84.84	83.99	83.84	85.09	85.39	84.54	85.64
5	84.59	85.09	85.54	86.04	87.29	84.79	84.04	83.94	85.09	85.49	84.69	85.54
6	85.19	85.44	85.29	86.39	87.09	84.79	84.19	83.84	84.94	85.54	84.84	85.49
7	85.69	85.29	85.19	86.89	86.84	84.84	84.19	83.79	84.01	85.29	84.84	85.39
8	85.64	85.29	85.14	87.49	86.99	84.94	84.09	83.74	84.84	84.94	84.89	85.34
9	85.59	85.24	85.09	88.29	87.09	85.19	83.99	83.62	84.99	84.84	84.99	85.24
10	85.79	85.19	85.14	88.04	87.09	85.19	84.19	83.84	84.99	84.64	84.99	85.19
11	85.54	85.14	85.19	87.69	87.19	85.09	84.14	83.94	85.09	84.49	85.04	85.04
12	85.34	85.09	85.19	87.09	87.59	85.19	84.09	83.74	84.94	84.34	84.99	84.74
13	85.19	85.14	85.14	86.94	87.89	85.19	84.09	83.79	84.79	84.19	84.89	84.79
14	85.14	85.09	85.09	87.39	87.19	85.19	84.14	83.79	84.89	*a*	84.89	84.89
15	85.19	85.09	85.14	88.59	86.84	85.14	84.09	84.04	84.84	*a*	84.89	85.14
16	85.49	85.09	85.19	89.59	86.59	85.04	83.99	84.24	84.99	*a*	84.94	85.14
17	85.29	85.09	85.09	89.44	86.59	84.94	83.94	84.79	84.99	*a*	89.94	84.89
18	85.14	85.04	84.99	88.94	86.59	84.89	83.70	85.19	84.99	*a*	84.84	84.74
19	84.94	85.39	84.89	88.49	86.49	85.04	63.84	85.39	84.94	*a*	84.84	84.54
20	84.79	86.94	84.89	88.19	86.44	85.04	63.89	85.49	84.94	*a*	84.89	84.34
21	84.84	87.14	84.79	88.29	86.24	85.19	83.94	85.29	84.89	84.49	84.79	84.09
22	84.69	86.84	84.64	88.14	86.09	85.14	84.24	84.99	84.94	84.44	84.94	84.09
23	84.74	86.59	84.69	87.79	85.99	84.84	84.29	84.89	84.99	84.39	85.04	84.04
24	84.84	86.69	84.94	87.44	85.84	84.59	84.14	84.59	85.04	84.34	84.99	83.99
25	84.94	87.29	85.24	87.09	85.74	84.49	84.09	84.34	85.09	84.24	84.99	83.99
26	84.99	87.04	85.54	87.09	85.59	84.34	84.04	84.39	84.99	84.29	85.09	83.89
27	85.09	86.69	85.79	86.94	85.44	84.24	84.19	84.24	84.94	84.69	85.24	83.99
28	84.99	86.54	85.69	86.74	85.29	84.39	84.09	84.39	84.84	84.69	85.34	84.24
29	84.84	......	85.84	86.69	85.29	84.34	84.09	84.24	84.99	84.09	85.49	84.14
30	84.79	......	85.79	86.64	85.49	84.19	84.09	84.19	85.14	84.59	85.59	84.09
31	84.74	......	85.79	......	85.54	......	84.04	84.14	......	84.44	......	84.04

a No record.

HUDSON RIVER AT SCHUYLERVILLE, N. Y.

This gage, which was established August 14, 1905, is located on the down-stream end of the fourth pier from the right-hand bank of Ferry street bridge at Schuylerville. The gage, which has painted tenth-foot marks, reads from zero to 16 feet. The zero mark is at elevation 81.50. Readings are taken at 8 A. M. and 5 P. M. by Walter Curtis. The river is divided by an island at the point where the bridge crosses. The gage is located on the right-hand channel near the island.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River at Schuylerville, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	84.80	86.50	89.70	87.00	89.40	86.10	84.55	84.10	84.50	85.40	85.35	85.55
2	84.80	86.20	89.00	87.15	89.65	85.85	84.30	84.15	84.80	85.60	85.20	85.50
3	84.80	85.70	88.20	87.35	90.20	85.50	84.15	84.20	85.25	85.30	85.15	85.45
4	84.80	85.50	87.85	87.65	90.30	85.45	84.30	84.15	85.10	85.60	84.95	85.40
5	84.90	86.10	87.70	87.95	90.20	85.40	84.60	83.85	84.80	85.45	85.10	85.25
6	86.25	86.60	86.95	88.55	90.00	85.80	84.50	83.95	85.40	85.40	85.10	85.30
7	86.75	86.35	86.90	89.90	89.45	86.50	84.55	84.10	84.40	85.40	85.10	85.45
8	86.70	86.00	86.90	92.50	89.90	86.35	84.40	84.00	85.25	85.15	85.10	85.45
9	86.40	86.40	86.70	92.85	90.30	86.10	84.50	84.05	85.25	84.95	85.15	85.25
10	86.20	86.60	86.60	92.40	89.45	85.90	84.60	84.20	85.30	84.80	85.15	85.15
11	86.00	86.85	86.55	91.30	90.55	85.95	84.50	84.15	85.25	84.65	85.20	85.35
12	85.90	86.70	86.30	90.15	91.35	86.45	84.45	84.15	85.20	84.50	85.15	85.40
15	85.80	86.50	86.05	89.80	91.65	86.10	84.50	84.20	85.05	84.50	85.15	85.45
14	85.70	86.30	86.00	91.05	90.25	86.15	84.35	84.30	84.90	84.40	85.10	85.20
15	85.70	86.45	86.15	94.10	89.95	86.00	84.20	64.15	85.00	84.60	85.05	84.95
16	85.45	86.65	86.00	95.65	89.05	85.95	84.30	84.30	85.05	84.80	85.15	84.60
17	85.30	86.80	85.90	95.35	89.05	85.65	84.15	84.90	85.10	84.75	85.20	84.55
18	85.30	86.80	85.70	94.40	88.95	85.40	84.20	85.40	85.25	84.90	85.10	84.35
19	85.30	87.30	85.60	93.85	88.95	85.90	84.10	85.85	85.00	85.10	85.15	84.35
20	85.30	91.05	85.45	93.45	88.65	85.95	84.15	85.70	84.90	85.00	85.10	64.05
21	85.20	91.10	85.25	93.50	88.25	85.95	84.10	85.50	84.25	84.90	85.00	84.15
22	85.20	90.75	85.65	93.20	88.00	85.60	84.70	85.20	84.65	84.70	85.00	84.15
23	85.20	90.35	85.55	92.30	87.85	85.40	84.55	85.40	85.00	84.40	85.30	84.15
24	85.65	91.00	85.80	91.55	87.65	85.15	84.50	85.20	85.10	84.30	85.40	84.35
25	86.75	92.40	85.75	90.50	86.95	85.45	84.50	85.15	85.20	84.20	85.20	84.15
26	87.45	91.50	87.50	90.10	86.95	85.75	84.50	84.65	84.80	85.00	85.30	84.10
27	87.75	90.55	87.05	90.00	86.85	85.30	84.30	84.55	84.50	85.20	85.40	84.20
28	87.45	90.10	87.15	89.40	86.40	84.80	84.50	84.50	84.45	85.30	85.50	84.40
29	87.35	......	87.35	89.20	86.35	81.60	84.45	84.30	84.90	85.40	85.50	84.45
30	86.85	......	86.90	89.00	86.65	84.60	84.35	81.35	85.30	85.30	85.50	84.50
31	86.50	......	86.85	......	86.55	......	84.10	84.20	......	85.10	......	84.90

MISCELLANEOUS MEASUREMENTS, HUDSON RIVER DRAINAGE.

A measurement of Fish creek, or Saratoga lake outlet, at Burgoyne, N. Y., was made by C. C. Covert, July 22, 1909. The stage of the stream, as shown by the gage on the bridge, was 1.40, and the discharge 124 second-feet.

Measurements of the Batten kill at Battenville, N. Y., were made by C. C. Covert on July 31, 1909. These measurements were made at the site of the temporary gaging station which was maintained in 1908.

Gage height	6.04	feet
Discharge	141	second-feet
Gage height	5.72	feet
Discharge	43	second-feet

HUDSON RIVER AT FREE BRIDGE NEAR LIBERTY MILLS.

A meter gaging station was established at the highway bridge over the Hudson river near Liberty Mills, October 23, 1905, by C. A. Poole.

This bridge, which is commonly known as "Free Bridge," is about three-quarters of a mile south of the State dam at Northumberland and about one-quarter of a mile north of the mouth of the Batten kill. The entire yield of the watershed passes the station, except that diverted at the dam at Northumberland for the supply of the Champlain canal, and that passing northerly from Glens Falls feeder.

The gage is of the weight-and-chain type, and is attached to the lower chord of the north truss of the east span at first panel point from pier.

The datum to which all gage readings are added is 83.12, which is the elevation of bottom of weight when the end of chain is opposite the zero of the gage. Observations of the stage of the stream are taken twice each day by Wm. Dunstan.

Current-meter measurements were made by C. A. Poole in 1905 and 1906 from the bridge, which consists of three spans, with a total length of 426.2 feet between abutments.

The river channel is partly of rock and partly of gravel and of uniform cross-section under the bridge. About 400 feet below the bridge are rapids. The channel is straight for several hundred feet below the bridge to a point where the stream is divided by an island. Above the bridge the river bends slightly to the south. The current is somewhat sluggish during low water.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River near Liberty Mills.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	84.82	87.32	90.37	87.77	91.02	86.77	84.97	84.07	84.97	85.42	85.17	85.52
2	84.62	86.92	89.72	87.87	90.82	86.52	84.82	84.27	85.12	85.42	85.12	85.52
3	84.62	86.62	89.37	88.27	91.27	86.22	84.82	84.52	85.27	85.32	84.82	85.32
4	84.72	85.32	88.82	88.42	91.52	86.32	84.37	84.62	84.32	85.47	85.12	85.32
5	85.02	86.07	88.72	88.97	91.27	86.22	84.87	84.32	84.07	85.67	85.12	85.32
6	86.77	86.57	87.92	89.67	91.22	86.82	85.42	84.07	84.12	85.62	84.82	85.47
7	87.87	87.37	87.42	91.22	90.47	87.27	84.97	84.27	84.87	85.52	84.82	85.62
8	87.52	87.82	87.27	94.02	90.77	87.22	84.82	84.12	85.22	85.37	84.97	85.52
9	87.17	87.67	86.92	94.27	91.47	86.92	84.82	84.12	85.37	85.17	85.12	85.52
10	87.02	87.92	86.72	93.92	90.72	86.62	84.87	84.32	85.42	85.07	85.12	85.12
11	86.82	87.72	87.07	92.82	91.82	86.92	84.62	84.72	85.42	84.82	84.82	85.12
12	86.62	87.72	87.02	91.57	92.62	87.22	84.52	84.82	85.12	84.52	85.22	84.92
13	86.32	87.62	86.82	90.92	93.02	87.12	84.42	84.72	85.12	84.77	85.22	85.02
14	86.02	87.42	86.42	92.07	91.97	86.92	84.42	84.77	85.17	84.62	85.22	85.17
15	85.72	87.32	86.32	95.57	91.02	86.92	84.42	84.42	85.27	84.92	85.52	85.12
16	86.02	87.57	86.72	97.22	90.22	86.62	84.42	84.42	85.22	84.97	85.07	85.02
17	86.22	87.82	86.62	96.82	90.02	86.42	84.42	84.77	85.32	84.97	85.12	84.77
18	86.12	87.82	86.52	96.02	90.12	86.52	84.12	85.42	85.52	84.92	85.22	84.52
19	86.22	87.72	86.17	95.17	90.12	86.92	84.27	86.02	85.12	85.37	85.02	84.52
20	86.32	92.72	86.07	94.92	89.92	86.62	84.42	85.97	84.82	85.52	85.37	84.82
21	86.17	92.57	86.12	94.97	89.42	86.62	84.32	85.77	84.92	85.07	85.22	84.72
22	85.97	92.12	86.12	94.32	88.92	86.32	84.72	85.42	85.02	84.72	85.32	84.72
23	85.77	91.62	86.22	93.47	89.12	85.92	84.82	85.47	85.22	84.32	85.42	84.62
24	86.07	91.87	86.32	92.82	89.32	85.62	84.77	85.07	85.37	84.12	85.22	84.62
25	86.77	93.62	87.07	92.07	88.47	85.37	84.62	84.82	85.42	84.22	85.02	84.07
26	88.57	92.47	88.37	91.17	87.97	85.32	85.22	84.52	85.12	85.17	85.17	84.02
27	88.67	91.57	87.57	91.02	87.42	84.87	85.27	84.52	84.42	85.42	85.52	84.57
28	88.42	91.02	87.77	90.52	87.02	85.42	85.07	84.57	84.52	85.52	85.62	85.12
29	88.07	......	87.97	90.52	87.07	84.97	84.82	84.07	85.32	85.52	85.62	85.07
30	87.97	......	87.72	90.07	87.72	84.97	84.82	84.22	85.27	85.52	85.62	85.02
31	87.72	......	87.67	......	87.47	......	84.87	84.72	......	85.32	......	85.07

HUDSON RIVER ABOVE DAM AT NORTHUMBERLAND, N. Y.

Champlain canal crosses the Hudson river in the pool formed by the State dam at Northumberland. The gage, which was established April 11, 1904, is located on the right-hand bank of the stream above Northumberland dam and about 200 feet downstream from the towing bridge. The gage is a vertical scale with painted tenth-foot marks and is attached to the docking forming the towpath wall. Readings are taken at 8 A. M. and 5 P. M. by G. Hammond. The zero mark of the gage is at elevation 100.58.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River above Dam at Northumberland, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	101.43	104.53	106.38	105.93	105.68	104.58	103.23	103.93	101.93	102.33	102.83	103.08
2	101.68	104.43	105.58	107.03	105.78	104.48	102.83	102.53	102.13	102.43	102.73	102.43
3	101.43	104.48	105.43	107.33	105.98	104.33	103.13	102.23	102.38	104.08	102.68	102.08
4	101.38	104.23	105.18	106.93	105.83	104.13	104.13	102.18	102.33	102.98	102.53	102.58
5	102.53	103.93	104.88	106.58	105.73	104.13	104.08	102.33	103.08	102.38	102.68	102.78
6	104.08	103.78	104.78	105.88	105.73	104.6-	104.08	102.33	102.28	102.38	102.68	103.43
7	104.48	104.33	104.68	106.53	105.38	104.93	103.83	103.03	102.38	102.23	104.13	102.68
8	104.93	104.43	104.58	108.08	105.68	104.78	103.78	102.53	101.98	102.18	103.08	102.43
9	104.48	104.68	104.43	108.53	106.18	104.68	103.83	102.43	102.13	102.23	102.73	102.08
10	104.23	104.88	104.38	108.33	105.53	104.48	103.98	102.33	102.43	102.33	102.73	102.18
11	104.43	104.78	104.28	107.98	106.08	104.53	104.18	102.18	103.78	103.43	102.73	101.63
12	104.28	104.73	104.23	107.48	106.63	104.88	103.03	102.33	102.78	102.28	102.58	102.93
13	104.13	104.58	104.18	107.48	106.68	104.83	102.43	102.43	012.73	102.03	102.58	102.63
14	103.23	104.58	104.38	107.23	105.98	104.53	102.38	103.58	102.58	102.08	103.98	101.98
15	102.13	104.53	104.23	107.33	105.78	104.43	102.38	102.78	102.38	102.08	103.03	101.28
16	102.08	104.73	104.13	107.08	105.33	104.43	102.28	102.48	102.28	102.08	102.53	101.33
17	102.68	104.83	104.38	106.68	105.18	104.28	102.23	103.58	102.53	103.88	102.53	101.18
18	102.68	104.78	104.28	106.43	105.18	104.18	103.13	102.98	103.48	102.43	102.48	101.23
19	103.53	105.48	104.23	105.83	105.23	104.43	102.98	102.48	102.58	102.38	102.68	101.38
20	103.33	106.13	104.08	105.23	105.08	104.58	102.03	102.78	101.83	102.48	102.78	102.73
21	102.88	106.13	103.63	105.38	104.88	104.78	102.08	103.78	102.18	102.48	104.23	101.88
22	103.13	106.03	103.58	105.38	104.63	104.13	102.68	103.48	102.38	102.68	102.93	102.13
23	102.38	106.03	103.63	105.53	105.13	103.93	102.68	102.38	102.33	102.83	102.73	102.43
24	102.68	106.58	104.18	105.53	104.53	103.48	104.33	102.43	102.28	103.83	102.68	102.68
25	103.28	106.23	104.68	105.58	104.08	103.83	102.93	102.33	103.53	103.18	102.43	103.93
26	130.33	106.13	104.13	105.38	104.23	103.83	102.58	102.53	102.43	102.63	102.63	103.43
27	104.78	105.98	104.33	105.33	104.13	104.33	102.53	102.13	102.53	102.63	102.58	102.33
28	105.23	*a*	104.33	105.23	103.98	103.93	102.48	102.28	102.63	102.58	104.23	102.08
29	105.13	......	104.03	105.53	104.78	103.73	102.23	103.58	102.58	102.58	103.13	102.48
30	104.98	......	104.13	105.38	104.33	103.38	102.33	102.58	102.43	102.88	103.23	102.43
31	104.83	......	104.13	......	104.58	......	102.33	102.58	......	104.43	......	102.33

a Record missing.

HUDSON RIVER AT HILL STREET BELOW FORT MILLER, N. Y.

A line of timber cribs crosses the Hudson river diagonally about one mile below Fort Miller dam. A gage was established at this point April 11, 1904, by J. A. O'Connor, for this Department. The gage is in two sections. The lower section is attached to the down-stream fact of the second crib, located about 55 feet from the left-hand bank. The upper section is attached to the down-stream face of the crib nearest the left-hand bank. The gage zero is at elevation 100.50. Readings of this gage and of the gages below and above Fort Miller dam are taken each morning and afternoon by L. C. Brazier.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River at Hill Street, below Fort Miller, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	102.50	105.80	107.90	105.85	107.05	106.30	103.20	103.85	102.25	102.75	103.05	102.75
2	102.10	105.70	107.45	105.95	107.40	105.20	103.00	102.85	102.25	102.45	102.60	102.55
3	101.95	105.60	107.25	106.15	107.45	104.45	103.15	102.30	102.25	104.15	102.55	102.65
4	102.20	105.30	107.15	106.50	107.45	104.40	104.05	102.35	102.05	103.05	102.60	102.60
5	103.15	105.25	106.90	106.60	107.20	104.35	104.35	102.20	103.20	102.35	102.65	103.25
6	104.55	05.35	106.70	107.15	107.25	104.90	104.30	102.30	102.50	102.25	102.70	103.20
7	105.50	105.75	106.60	108.15	106.70	105.05	103.80	102.30	102.55	102.20	103.60	102.65
8	105.70	106.05	106.25	109.20	107.10	105.00	103.80	103.25	102.45	102.30	103.25	102.65
9	105.60	106.05	106.20	109.60	107.80	104.85	103.90	102.95	102.55	102.40	102.75	102.35
10	105.35	106.05	106.05	109.20	106.90	104.70	103.90	102.40	102.40	103.70	102.65	102.50
11	105.55	106.10	106.05	108.40	107.85	104.75	104.05	102.55	102.55	102.60	102.70	102.00
12	105.40	106.05	106.10	107.60	108.45	105.00	102.95	102.40	103.75	102.20	102.65	102.95
13	105.20	106.00	106.10	107.20	108.70	105.20	102.45	102.20	102.60	102.30	102.75	103.20
14	104.75	106.10	106.25	108.25	108.50	104.70	102.40	102.50	102.45	102.05	103.80	102.25
15	104.20	105.90	106.05	110.50	108.30	104.65	102.40	103.30	102.50	102.25	103.20	102.15
16	104.00	106.00	106.00	111.30	107.75	106.40	102.35	102.65	102.35	102.55	102.55	101.45
17	104.30	106.10	105.90	110.95	107.60	104.40	102.20	102.40	102.35	103.55	102.50	101.65
18	103.50	106.20	105.80	110.50	107.60	104.30	102.90	103.60	102.60	102.95	102.60	101.85
19	104.40	106.25	105.75	109.80	107.70	104.60	102.90	103.20	103.65	102.65	102.65	101.65
20	104.05	107.05	105.80	109.60	107.20	105.20	102.20	102.75	102.85	102.45	102.70	102.05
21	104.20	108.15	105.95	109.70	107.05	104.95	102.30	102.70	101.90	102.35	104.05	101.85
22	103.65	107.90	105.30	109.40	106.85	104.25	102.75	103.55	102.40	102.50	103.20	102.00
23	103.80	107.80	105.25	108.85	107.10	104.15	102.65	103.45	102.45	102.65	102.65	102.00
24	105.00	107.85	105.35	108.35	106.55	103.50	102.60	102.25	102.40	103.50	102.55	102.00
25	104.30	108.5	105.90	107.90	106.10	103.60	104.2	102.30	102.25	103.05	102.65	103.80
26	105.95	108.35	106.3	107.25	106.15	103.50	103.15	102.40	103.15	102.85	102.55	102.60
27	106.20	108.20	106.85	107.35	106.05	104.25	102.65	102.55	102.70	102.85	103.00	102.70
28	106.15	108.20	106.25	106.85	106.10	104.15	102.50	102.15	102.30	102.80	103.45	102.00
29	106.05	......	106.00	106.95	106.45	103.45	102.50	102.35	102.30	102.75	103.40	102.20
30	106.00	......	105.60	106.00	107.15	103.30	102.30	102.95	102.40	102.75	103.00	101.90
31	106.00	......	105.00	......	106.45	......	102.55	102.35	......	104.10	......	101.75

HUDSON RIVER BELOW DAM AT FORT MILLER, N. Y.

This gage, which was established April 11, 1904, is attached to the face of the bulkhead wall below the Fort Miller Paper Co.'s mill. The gage is near the down-stream end of the wall and is divided decimally from zero to 8 feet. The zero mark is at elevation 104.08.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River below Dam at Fort Miller, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	104.83	105.73	107.13	105.43	106.78	105.28	104.88	104.88	104.88	104.88	104.88	104.88
2	104.78	105.53	106.68	105.53	106.98	105.18	104.88	104.78	104.88	104.88	104.88	104.88
3	104.68	105.38	106.33	105.63	107.03	105.08	104.88	104.88	104.88	105.08	104.88	104.88
4	104.68	105.23	106.13	105.78	107.03	105.13	104.88	104.88	104.88	104.93	104.83	104.88
5	104.78	105.18	105.93	105.88	106.98	105.13	104.88	104.83	104.88	104.93	104.83	104.88
6	104.88	105.23	105.88	106.18	106.98	105.23	104.93	104.88	104.88	104.93	104.78	104.93
7	105.38	105.28	105.83	107.08	106.68	105.48	104.88	104.88	104.88	104.88	104.98	104.88
8	105.48	105.63	105.53	108.58	106.98	105.48	104.93	104.78	104.88	104.88	104.93	104.88
9	105.43	105.68	105.53	108.98	107.33	105.43	104.88	104.83	104.88	104.88	104.88	104.83
10	105.33	105.58	105.33	108.63	106.83	105.33	104.88	104.88	104.88	104.98	104.88	104.88
11	105.28	105.53	105.18	107.68	107.28	105.38	104.88	104.88	104.88	104.88	104.88	104.83
12	105.23	105.58	105.18	107.08	107.98	105.48	104.78	104.88	104.88	104.88	104.88	104.83
13	105.08	105.48	105.18	106.88	108.18	105.28	104.88	104.88	104.88	104.88	104.98	104.83
14	105.03	105.48	105.28	107.63	107.13	105.33	104.83	104.88	104.88	104.93	104.88	104.88
15	104.98	105.38	105.18	109.88	106.93	105.28	104.83	104.88	104.88	104.93	104.88	104.83
16	104.93	105.48	105.18	110.83	106.53	105.28	104.83	104.88	104.88	104.93	104.88	104.83
17	105.28	105.58	105.08	110.48	106.38	105.18	104.83	104.88	104.88	104.03	104.88	104.83
18	105.08	105.58	105.18	109.98	106.38	105.13	104.88	104.98	104.88	104.93	104.88	104.83
19	105.13	105.58	105.03	109.38	106.43	105.23	104.78	104.93	104.98	105.03	104.88	104.78
20	105.08	106.23	104.98	109.13	106.28	105.23	104.83	104.98	104.88	104.98	104.88	104.83
21	105.03	107.73	105.08	109.18	106.13	105.18	104.83	104.98	104.88	104.93	104.93	104.88
22	104.98	107.48	104.93	108.78	105.98	105.08	101.88	104.88	104.88	104.88	104.83	104.88
23	104.98	107.38	104.98	108.23	105.68	105.03	104.88	104.88	104.88	104.88	104.83	104.88
24	104.88	107.28	105.03	107.88	105.78	104.88	104.88	104.88	104.88	104.88	104.88	104.83
25	104.93	107.88	105.38	107.48	105.63	104.88	104.88	104.88	104.88	104.93	104.83	104.88
26	105.73	107.73	105.68	106.98	105.63	104.88	104.88	104.88	104.98	104.98	104.88	104.83
27	105.98	107.43	105.48	107.08	105.38	104.98	104.88	104.83	104.93	105.03	104.93	104.88
28	106.03	107.28	105.38	106.73	105.33	104.88	104.88	104.88	104.88	104.98	104.98	104.88
29	106.08	......	105.48	106.73	105.38	104.88	104.88	104.78	104.88	104.98	104.88	104.78
30	105.98	......	105.38	106.48	105.53	104.88	104.83	104.83	104.88	104.98	104.88	104.83
31	105.98	......	105.38	......	105.43	......	104.83	104.88	......	105.03	......	104.88

HUDSON RIVER ABOVE DAM AT FORT MILLER, N. Y.

A gage was established in the pond above the Fort Miller dam April 11, 1904, by this Department. The gage is attached to the face of the line of ice breakers extending up-stream from the dam near the left-hand bank of the river. The gage is about 325 feet up-stream from the paper mill and is divided by painted tenth-foot marks from zero to 18 feet. The zero mark is at elevation 114.00. The crest of the dam is at elevation about 115.00 and is 639 feet long. Water is diverted for power purposes at the left-hand end of the dam. Power was formerly used at the right-hand end of the dam.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River above Dam at Fort Miller, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	114.95	116.25	117.45	116.80	118.00	116.40	115.55	115.55	115.05	115.15	115.00	115.50
2	114.90	116.10	117.25	116.85	118.45	116.25	115.50	114.85	115.05	115.25	115.10	115.65
3	115.55	116.10	117.20	116.95	118.20	116.15	115.55	115.00	115.05	116.60	114.70	115.15
4	114.95	115.95	117.10	117.55	118.20	116.20	115.80	114.90	114.80	115.85	114.70	115.65
5	115.25	115.90	116.85	117.20	118.10	116.20	115.95	114.80	115.50	115.45	115.10	116.20
6	115.60	115.95	116.60	117.60	118.10	116.65	115.80	114.90	114.30	115.00	114.95	115.70
7	116.15	116.45	116.95	118.15	117.80	116.60	115.15	114.95	115.20	114.75	115.55	115.85
8	116.30	116.40	116.45	119.20	118.10	116.70	115.30	115.45	115.10	114.85	115.10	115.45
9	116.25	116.50	116.45	119.40	118.45	116.55	115.40	114.85	115.30	114.85	115.00	115.10
10	116.55	116.40	116.15	119.20	117.95	116.45	115.40	114.95	115.05	115.85	114.85	115.60
11	116.25	116.40	116.20	118.75	118.50	116.40	115.80	115.10	114.90	114.75	115.00	115.40
12	116.15	116.40	116.20	118.35	118.80	116.60	114.65	115.15	115.50	114.85	115.05	115.35
13	115.90	116.40	116.20	118.00	118.80	116.75	115.25	115.75	114.80	115.05	115.50	115.20
14	115.65	116.65	116.55	118.55	118.30	116.45	115.05	115.85	114.90	115.30	115.70	115.10
15	115.50	116.20	116.15	119.85	118.20	116.45	114.85	115.85	115.05	115.10	155.55	115.15
16	115.85	116.30	116.10	120.20	118.30	116.35	114.90	115.55	115.00	115.25	115.05	115.10
17	116.10	116.40	116.10	120.10	117.80	116.25	114.70	117.70	115.05	115.70	114.85	114.85
18	115.65	116.40	116.10	119.95	117.80	116.25	115.55	116.05	115.30	115.05	115.15	114.90
19	115.60	116.40	116.05	119.65	117.85	116.30	114.65	116.00	115.80	115.70	115.15	115.10
20	115.45	116.90	116.00	119.50	117.60	116.65	114.90	116.00	114.80	115.30	115.40	115.20
21	115.40	117.85	116.45	119.50	117.45	116.30	114.85	115.95	115.00	115.00	116.00	115.20
22	115.35	117.60	116.05	119.30	117.40	116.20	115.35	115.95	115.20	114.85	115.25	115.35
23	115.40	117.55	116.10	118.95	117.45	116.05	115.20	115.70	115.05	114.95	115.15	115.25
24	115.70	117.50	116.15	118.70	117.15	115.80	115.30	115.20	115.20	115.25	115.00	115.05
25	115.20	118.00	116.55	118.60	116.95	115.80	115.65	114.80	114.85	114.95	115.15	115.25
26	116.50	117.90	116.95	118.25	116.90	115.75	115.55	115.30	115.65	115.70	114.90	115.35
27	116.70	117.70	116.70	118.15	116.70	116.20	115.35	115.10	114.85	115.60	115.90	115.55
28	116.70	117.95	117.10	117.95	116.55	115.85	115.35	114.85	115.05	115.35	116.20	115.05
29	116.60	......	116.80	118.00	116.60	115.70	115.25	115.20	114.90	115.30	115.90	115.00
30	116.50	......	116.75	117.80	117.10	115.65	114.90	115.10	115.10	115.30	116.00	115.00
31	116.75	......	116.70	......	116.60	......	114.80	115.00	......	115.95	......	115.40

HUDSON RIVER ABOVE CROCKER'S REEF DAM.

A gage was established above Crocker's Reef 450 feet up-stream from the head of Thompson's Island April 11, 1904, by J. A. O'Connor, for this Department. The reef has since been submerged by construction of a dam for the Barge canal. The gage is a painted scale subdivided to tenths of a foot from zero to 18 feet and is attached to the down-stream side of a large elm tree. The gage zero is at elevation 115.06. Readings are taken at 8 A. M. and 5 P. M. by Fred C. Bristol.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River above Crocker's Reef Dam.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	119.61	120.46	121.71	120.81	122.11	120.46	119.86	119.76	119.66	119.56	119.51	119.66
2	119.56	120.36	121.51	120.96	122.26	120.41	119.86	119.46	119.56	119.51	119.56	119.71
3	119.56	120.26	121.31	121.11	122.41	120.36	119.81	119.56	119.51	119.46	119.46	119.61
4	119.56	120.16	121.16	121.21	122.41	120.26	119.71	119.61	119.41	119.61	119.51	119.76
5	119.76	120.16	120.96	121.46	122.31	120.41	119.71	119.61	119.46	119.66	119.66	119.41
6	119.91	120.16	120.76	121.81	122.31	120.51	119.81	119.56	119.56	119.56	119.51	119.81
7	120.46	120.31	120.66	122.56	122.06	120.66	119.76	119.56	119.71	119.46	119.61	119.81
8	120.51	120.61	120.66	123.46	122.26	120.76	119.76	119.56	119.56	119.51	119.41	119.61
9	120.46	120.66	120.56	123.76	122.46	120.61	119.76	119.46	119.41	119.51	119.66	119.66
10	120.26	120.61	120.46	123.46	122.11	120.51	119.76	119.66	119.46	119.41	119.51	119.76
11	120.41	120.61	120.46	123.01	122.61	120.51	119.66	119.56	119.66	119.46	119.51	119.51
12	120.36	120.61	120.51	122.51	123.06	120.71	119.66	119.46	119.61	119.51	119.56	119.31
13	120.06	120.61	120.51	122.21	123.11	120.56	119.76	119.56	119.51	119.46	119.71	119.56
14	120.06	120.46	120.46	122.81	122.51	120.51	119.66	119.56	119.71	119.56	119.51	119.66
15	119.91	120.51	120.46	124.36	122.41	120.51	119.51	119.46	119.61	119.56	119.71	119.51
16	119.91	120.51	120.41	125.01	121.71	120.51	119.56	119.51	119.61	119.46	119.46	119.46
17	119.81	120.61	120.41	124.76	141.86	140.46	119.56	119.76	119.61	119.61	119.36	119.41
18	119.91	120.66	120.31	124.36	121.86	120.36	119.46	119.86	119.66	119.66	119.61	119.61
19	119.86	120.56	120.26	123.96	121.96	120.46	119.46	119.86	119.51	119.51	119.61	119.26
20	119.86	121.16	120.26	123.81	121.81	120.61	119.56	119.86	119.66	119.56	119.81	119.51
21	119.86	121.81	120.26	123.86	121.61	120.51	119.71	119.81	119.56	119.56	119.56	119.36
22	119.81	121.81	120.31	123.66	121.56	120.36	119.76	119.26	119.66	119.51	119.51	119.66
23	119.86	121.76	120.36	123.21	121.51	120.16	119.76	119.76	119.66	119.41	119.51	119.66
24	119.76	122.01	120.41	122.96	121.31	120.11	119.86	119.66	119.61	119.56	119.41	119.56
25	119.86	122.21	120.71	122.51	121.11	120.16	119.86	119.56	119.46	119.56	119.71	119.36
26	120.76	122.01	121.16	122.31	121.06	120.16	119.56	119.61	119.46	119.81	119.41	119.26
27	120.91	121.86	120.96	122.31	120.81	120.11	119.61	119.71	119.46	119.81	119.81	119.71
28	120.86	121.81	121.01	122.06	120.61	119.96	119.71	119.46	119.51	119.61	119.61	119.66
29	120.76	......	120.96	122.01	120.51	119.86	119.61	119.41	119.51	119.76	119.81	119.66
30	120.71	......	120.86	121.81	120.66	119.86	119.56	119.56	119.51	119.66	119.91	119.66
31	120.56	......	120.76	......	120.71	......	119.56	119.41	......	119.66	......	119.66

HUDSON RIVER AT MOUTH OF MOSES KILL, 2½ MILES ABOVE FORT MILLER, N. Y.

This gage was established December 1, 1906. Readings are taken at 7 A. M. and 5 P. M. each day by Thomas B. Sanders. The gage is located on the left-hand bank of the Hudson river a short distance above the mouth of Moses Kill, 2½ miles above Fort Miller.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River at Moses Kill.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	119.60	120.70	122.60	121.25	122.95	120.70	119.85	119.60	119.75	119.65	119.45	119.90
2	119.50	120.55	121.85	121.20	123.05	120.55	119.80	119.40	119.80	119.50	119.45	119.85
3	119.40	120.35	121.65	121.45	123.20	120.55	119.65	119.50	119.70	119.45	119.35	119.55
4	119.40	120.35	121.55	121.55	123.30	120.35	119.65	119.60	119.70	119.55	119.30	119.55
5	119.80	120.20	121.15	121.85	123.10	120.20	119.80	119.50	119.45	119.55	119.65	119.40
6	120.30	120.25	121.05	122.45	123.05	120.50	119.85	119.50	119.60	119.55	119.65	119.65
7	120.60	120.45	120.65	123.45	122.60	121.10	119.65	119.50	119.75	119.55	119.40	119.65
8	120.70	120.25	120.85	124.80	123.00	121.05	119.55	119.40	119.45	119.55	119.60	119.55
9	120.55	120.95	120.75	125.10	123.45	120.80	119.60	119.45	119.65	119.50	119.45	119.65
10	120.40	120.95	120.55	124.80	122.80	120.75	1 9.65	119.55	119.75	119.25	119.40	119.80
11	120.40	120.90	120.55	123.75	123.45	120.95	119.80	119.50	119.85	119.35	119.40	119.70
12	120.60	120.85	120.80	123.50	124.15	121.00	119.50	119.50	119.65	119.40	119.65	119.50
13	120.50	120.85	120.85	123.10	124.30	120.70	119.55	119.40	119.60	119.55	119.60	119.55
14	120.40	120.80	120.35	122.90	123.35	120.70	119.70	119.45	119.45	119.50	119.50	119.55
15	120.30	120.75	120.55	125.90	123.05	120.70	119.65	119.25	119.55	119.70	119.60	119.45
16	120.15	120.75	120.[illegible]5	126.75	122.50	120.65	119.55	119.55	119.60	119.65	119.50	119.60
17	120.00	120.80	120.75	126.50	122.60	120.55	119.60	119.60	119.75	119.35	119.45	119.40
18	120.00	120.95	120.45	125.85	122.50	120.50	119.35	119.80	119.75	119.65	119.50	119.65
19	120.00	120.95	120.35	125.35	122.55	120.60	119.40	119.75	119.45	119.75	119.40	119.30
20	119.95	121.90	120.25	125.20	122.30	120.85	119.55	119.80	119.30	119.65	119.60	119.50
21	119.85	122.90	119.80	125.25	122.10	120.55	119.55	119.80	119.70	119.60	119.40	119.50
22	119.80	122.90	120.45	125.00	121.95	120.40	119.60	119.35	119.70	119.60	119.65	119.60
23	119.95	122.85	120.45	1 4.40	122.05	120.35	119.75	119.75	119.65	119.50	119.55	119.60
24	119.85	122.85	120.55	124.00	121.55	120.35	119.85	119.70	119.50	119.30	119.50	119.70
25	120.00	123.30	121.05	123.65	121.40	120.10	119.80	119.40	119.45	119.55	119.75	119.35
26	121.05	123.10	121.25	123.20	121.20	120.10	119.85	119.35	119.30	119.55	119.50	119.20
27	121.15	122.80	121.50	123.10	121.05	119.80	119.75	119.40	119.35	119.60	119.75	119.65
28	121.10	122.60	121.20	122.75	120.85	119.95	119.65	119.45	119.45	119.55	119.50	119.65
29	121.00	......	121.40	122.75	120.80	119.85	119.55	119.25	119.40	119.55	119.75	119.65
30	121.00	......	121.00	122.50	121.05	119.85	119.50	119.40	119.40	119.55	119.80	119.70
31	120.80	......	121.10	......	120.85	......	119.55	119.65	......	119.60	......	119.75

HUDSON RIVER OPPOSITE MOUTH OF SNOOK KILL, 2½ MILES BELOW FORT EDWARD, N. Y.

This gage was established April 11, 1904, by J. A. O'Connor, for this Department. The gage is attached to a tree along the left-hand bank of the Hudson river between the river and the Champlain canal. It is divided from zero to 16 feet by painted tenth-footh marks and readings are taken at 9 A. M. and 5 P. M. by R. S. Metcalf. The zero of the gage is at elevation 114.59.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River opposite Snook Kill near Fort Edward, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	119.85	121.05	123.10	121.55	123.70	121.05	120.05	119.85	120.00	119.95	119.75	119.95
2	119.80	120.85	122.75	121.70	123.85	120.95	119.95	119.70	119.95	119.95	119.75	120.05
3	119.80	120.75	122.35	121.95	124.20	120.80	120.10	119.90	120.05	119.95	119.65	119.90
4	119.80	120.55	122.10	122.10	124.10	120.80	119.90	119.90	119.75	119.90	119.65	120.10
5	120.05	120.55	121.80	122.45	123.90	120.75	120.00	119.85	119.60	119.95	119.90	119.70
6	120.30	120.63	121.60	123.10	123.95	120.80	120.15	119.80	119.55	119.85	119.90	120.10
7	121.00	120.80	121.20	124.30	123.30	121.45	119.80	119.80	120.10	119.80	119.70	120.10
8	121.05	121.45	121.20	126.15	123.90	121.40	120.00	119.75	119.80	119.75	119.80	119.95
9	121.00	121.45	121.10	126.35	124.30	121.20	120.05	119.75	119.90	119.75	119.85	120.00
10	120.80	121.35	120.95	125.85	123.55	121.00	120.10	119.85	119.90	119.60	119.75	120.10
11	120.95	121.35	121.00	124.95	125.00	121.20	119.80	119.90	119.85	119.70	119.80	120.00
12	120.90	121.35	121.05	124.25	125.35	121.40	120.00	119.90	119.85	119.70	119.80	119.65
13	120.60	121.35	121.00	123.90	125.50	121.05	119.95	119.90	119.70	119.75	120.05	119.90
14	120.50	121.15	120.75	125.20	124.25	121.10	119.95	120.05	119.85	119.80	119.75	119.90
15	120.35	121.15	121.00	127.45	124.10	121.15	119.85	119.65	119.95	119.85	120.05	119.85
16	120.30	121.25	120.90	128.45	123.15	121.00	119.90	119.70	119.85	119.85	119.75	119.70
17	120.15	121.40	120.80	128.00	123.30	120.80	119.85	119.90	119.85	119.70	119.75	119.70
18	120.25	121.45	120.70	127.35	123.30	120.75	119.65	120.20	120.05	119.80	119.80	119.85
19	120.30	121.35	120.60	126.75	123.35	121.00	119.70	120.15	119.75	120.15	119.90	119.55
20	120.25	122.25	120.70	126.60	122.95	121.25	119.85	120.20	119.60	119.85	120.05	119.85
21	120.15	123.75	120.35	126.70	122.75	120.85	119.75	120.15	119.75	119.85	119.75	119.80
22	120.10	123.75	120.70	126.30	122.55	120.75	120.05	119.70	119.85	119.80	119.95	119.95
23	120.15	123.60	120.75	125.60	122.45	120.65	120.05	120.15	119.90	119.70	119.90	119.90
24	120.10	123.55	120.85	125.10	122.10	120.45	120.05	119.85	119.95	119.55	119.70	119.90
25	120.30	124.40	121.25	124.40	121.85	120.35	120.05	119.65	119.80	119.70	119.95	119.60
26	121.50	124.10	121.95	124.05	121.65	120.35	120.25	119.65	119.60	120.05	119.70	119.50
27	121.75	123.85	121.60	124.05	121.40	120.45	120.00	119.75	119.70	120.05	120.10	120.05
28	121.75	123.50	121.70	123.55	121.20	120.15	120.00	119.75	119.75	119.95	119.95	120.00
29	121.60	......	121.70	123.60	121.25	120.05	119.95	119.95	119.95	119.90	120.05	119.90
30	121.45	......	121.45	123.20	121.55	120.10	119.85	119.70	119.85	119.85	120.20	119.90
31	121.20	......	121.45	......	121.20	......	119.80	119.85	......	119.90	......	119.95

HUDSON RIVER AT BRIDGE STREET, FORT EDWARD, N. Y.

This gage was established April 11, 1904, by J. A. O'Connor, for this Department. The gage is located on the down-stream end of the pier nearest the left-hand bank of the Hudson river at Bridge street bridge. This bridge is about 2,500 feet down-stream from the dam of the International Paper Co. and the river is divided by an island and the gage is located on the left-hand channel. The zero mark of the gage was at elevation 117.80, July 19, 1908, to January 4, 1909, and at 117.84 after January 4, 1909. Readings are taken at 8 A. M. and 5 P. M. by B. F. Thebo.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River at Bridg Street, Fort Edward, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	119.30	121.60	124.05	121.80	124.40	120.90	119.80	119.40	119.80	119.80	119.80	120.00
2	119.30	121.60	123.30	121.80	124.70	120.80	120.00	119.70	119.80	119.80	119.80	120.20
3	119.30	121.15	122.80	121.80	124.80	120.60	119.80	119.80	119.80	119.60	119.80	120.10
4	119.50	121.00	122.80	122.55	124.80	120.60	119.40	119.80	119.80	119.60	119.80	119.90
5	119.80	121.00	122.05	123.80	124.60	120.70	119.40	119.80	119.50	119.80	119.80	119.70
6	120.35	120.60	121.80	125.20	124.30	121.30	119.80	119.80	119.80	119.80	119.80	119.80
7	121.30	121.60	121.40	127.30	124.05	120.90	119.80	119.80	119.80	119.80	119.60	119.85
8	121.30	121.60	121.35	127.40	124.60	121.00	119.80	119.50	119.80	119.80	119.60	119.80
9	121.00	121.60	121.00	126.95	125.30	120.60	119.80	119.40	119.80	119.80	119.60	119.90
10	120.60	121.60	120.80	126.80	125.30	120.60	119.80	119.80	119.80	119.60	119.60	119.90
11	120.60	121.60	120.80	125.70	125.30	120.80	119.40	119.80	119.80	119.60	119.60	119.80
12	120.60	121.60	120.80	125.05	126.20	121.00	119.40	119.80	119.50	119.60	119.60	119.50
13	120.40	121.60	120.80	124.60	126.65	120.80	119.80	119.80	119.80	119.80	119.60	119.60
14	120.00	121.30	120.80	126.05	125.05	120.80	119.80	119.70	119.80	119.80	119.40	119.60
15	120.00	121.60	120.80	128.95	125.05	120.80	119.80	119.30	119.80	119.80	119.80	119.50
16	120.00	121.60	120.80	130.00	123.80	120.60	119.80	119.80	119.80	119.80	119.80	119.40
17	119.80	121.80	120.30	129.45	123.90	120.60	119.80	119.80	119.80	119.70	119.80	119.40
18	119.60	121.80	120.30	129.05	123.80	120.60	119.40	120.10	119.80	119.80	119.80	119.40
19	119.60	121.80	120.80	128.30	124.00	120.70	119.80	120.20	119.50	119.80	119.80	119.20
20	119.60	122.90	120.80	128.15	124.15	120.80	119.80	120.00	119.20	119.80	119.80	119.60
21	119.60	124.60	120.55	127.90	123.30	120.80	119.80	120.00	119.50	119.80	119.80	119.60
22	119.60	124.30	120.30	127.45	123.05	120.80	119.80	119.50	119.80	119.80	119.80	119.60
2	119.60	124.30	120.30	126.55	122.80	120.40	119.80	119.80	119.80	119.80	119.80	119.80
24	120.30	124.30	120.30	126.05	122.55	120.30	119.80	119.80	119.80	119.40	119.80	119.80
25	120.40	125.30	120.80	125.80	121.80	120.20	119.40	119.80	119.80	119.70	119.80	119.60
26	121.55	125.45	122.05	124.95	121.80	120.20	119.60	119.80	119.60	119.80	119.80	119.30
27	121.90	125.30	121.60	125.00	121.40	120.20	119.80	119.80	119.80	119.80	119.80	120.00
28	121.60	125.00	121.60	124.20	121.40	120.20	119.80	119.80	119.90	119.80	119.80	120.00
29	121.45	......	121.70	124.00	121.40	120.20	119.80	119.50	119.80	119.90	119.80	119.80
30	121.00	......	121.70	123.50	121.30	119.90	119.80	119.80	119.80	119.80	119.80	120.00
31	120.80	......	121.60	......	121.00	......	119.80	119.80	......	119.80	......	120.00

HUDSON RIVER AT FORT EDWARD DAM.

This station, which is located at the dam of the International Paper Company, was established by Geo. W. Rafter in 1895, in connection with Upper Hudson storage surveys.* Since 1899 this station has been maintained by the U. S. Geological Survey in coöperation with this Department. The dam is of framed timber on slate rock foundation, and has but little leakage. The crest is straight, very nearly level, and 587.6 feet in length. Flash-boards are usually maintained on the dam from 15 inches to 18 inches in height. A record is kept of the height of flash-boards, and of the times of their setting and removal.

There are 62 water-wheels in the adjoining mill. These are nearly all of modern types which have been tested at the Holyoke flume. A record is kept of the daily run of each in hours, as well as of the working head, which is usually 18 feet. The discharge through the turbines is taken from diagrams expressing the flow as a function of the working head and number of wheel-hours run.

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* See report of State Engineer and Surveyor of New York, 1895, p. 105.

In the winter of 1896–1897, a flood spillway was cut around the south end of the dam, over which the water begins to flow whenever it reaches the level of the crest of the flash-board. The profile of the spillway is very irregular and causes some uncertainty in the calculated flow during times of high water.

Whenever the flash-boards are off from the main dam, the flow is computed by means of coëfficients derived from the United States Geological Station experiments on a model dam of similar cross-section.

With the flash-boards on, the flow has been computed from Francis' well-known formula for the thin-edged weir. During the dry season, but little water passes over the dam, the entire flow being employed to drive the turbines.

A new profile of the crest of the dam, obtained in 1906, has been used to determine the discharge for the present year.

The drainage area tributary to the Hudson above Fort Edward is 0.62 of that of the same stream above Mechanicville gaging station. The principal intervening tributaries are the Hoosic river and Batten kill.

During the navigation season water is diverted from the Hudson river for the supply of the Champlain canal at Glens Falls feeder dam, seven miles up-stream from Fort Edward, and also at the Northumberland dam.

Mean Daily Discharge, Second-feet, of Hudson River at International Paper Co.'s Dam Fort Edward, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1,693	4,914	10,475	7,924	13,310	5,524	2,178	*962	1,968	1,770	1,873	2,105
2	1,693	4,780	8,904	8,576	*12,384	5,303	2,164	1,734	2,529	2,079	1,131	2,114
3	*1,439	3,651	7,481	9,943	15,630	4,981	1,907	1,734	2,328	*1,581	1,073	1,878
4	1,943	3,523	7,141	*8,782	14,750	5,204	*684	1,459	2,082	1,770	1,387	2,491
5	2,183	3,603	6,320	11,540	14,750	5,204	736	1,538	*684	1,686	1,048	*1,300
6	2,476	3,342	5,758	13,866	14,023	*4,000	2,632	1,459	684	1,489	1,577	2,344
7	4,472	*4,097	*3,125	19,627	12,278	6,588	1,936	1,616	2,957	1,406	*1,141	2,282
8	4,659	5,519	5,121	27,521	14,848	6,433	2,088	*826	1,710	1,529	1,602	1,608
9	5,054	5,399	5,203	27,585	*14,415	5,914	2,275	940	2,004	*1,097	1,649	1,944
10	*4,680	5,600	4,862	25,670	13,602	5,540	2,298	1,138	1,988	908	1,623	1,944
11	4,862	5,303	5,571	*19,325	18,020	5,914	*1,277	1,677	2,310	1,097	1,721	1,923
12	4,862	5,203	5,623	18,242	21,207	6,433	1,562	1,342	*962	1,546	1,764	*684
13	3,605	5,203	5,825	16,480	20,315	*4,214	1,782	1,497	1,197	1,546	1,921	1,384
14	3,008	*4,977	*6,843	22,753	15,870	5,651	1,478	2,057	2,114	1,110	*1,560	1,944
15	2,789	4,989	5,780	30,858	14,844	5,715	1,549	*1,221	1,710	1,489	1,970	1,384
16	2,799	4,914	5,311	33,118	*10,238	5,031	1,549	1,643	1,932	1,938	1,215	747
17	*2,130	5,203	4,854	31,819	12,215	5,070	1,373	2,340	2,334	*908	1,384	1,161
18	2,883	5,191	4,730	*28,743	11,905	4,679	*962	2,884	20	1,475	1,833	1,301
19	2,528	5,281	4,068	25,359	12,342	4,820	1,197	2,875	*20	1,784	1,439	*684
20	2,632	6,473	4,344	24,836	11,029	*2,948	1,937	2,957	20	2,000	2,783	1,384
21	2,476	*11,429	*3,339	25,621	10,045	4,802	2,055	2,207	1,589	1,460	*684	1,384
22	2,465	11,733	4,252	24,470	9,426	4,448	2,394	*1,556	1,870	1,460	2,783	1,300
23	2,611	11,482	4,021	24,571	*8,033	3,770	2,497	2,341	1,590	1,712	1,720	1,364
24	*1,879	10,579	4,916	21,281	8,396	3,675	2,584	1,674	1,871	*684	1,524	1,638
25	3,921	13,486	5,796	*12,405	6,691	3,349	*962	2,004	1,509	1,803	1,527	684
26	5,758	12,782	6,576	12,947	6,891	3,546	3,417	1,674	*962	2,513	2,089	*965
27	6,326	11,319	6,443	13,751	6,354	*2,100	2,076	1,636	1,197	1,843	3,928	1,552
28	6,473	*11,502	*4,758	9,968	5,914	2,707	2,664	1,636	1,197	2,376	*1,550	1,496
29	5,758	....	6,417	11,038	7,010	2,357	1,751	*1,737	1,814	1,571	3,284	1,496
30	5,520	....	5,766	9,298	5,599	2,378	1,675	1,197	1,758	2,354	2,474	1,492
31	*5,332	....	5,676	....	*6,276	......	1,862	2,224	......	*1,155	......	1,552
Mean	3,578	6,838	5,655	19,264	11,891	4,617	1,855	1,735	1,563	1,585	1,774	1,533

* Indicates Sundays.

Monthly Discharge of Hudson River at International Paper Co'.s Dam, Fort Edward, N. Y

[Drainage area, 2,800 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean	Per square mile.	Depth in inches on drainage. area.
1909.					
January	6,473	1,439	3,578	1.28	1.47
February	13,486	3,342	6,838	2.44	2.54
March	10,475	3,125	5,655	2.02	2.32
April	33,118	7,924	19,264	6.88	7.71
May	21,207	5,599	11,891	4.25	4.89
June	6,588	2,160	4,617	1.65	1.865
July	3,417	684	1,855	0.663	0.762
August	2,957	826	1,735	0.620	0.713
September	2,957	20	1,563	0.558	0.625
October	2,513	684	1,585	0.566	0.651
November	3,928	684	1,774	0.634	0.710
December	2,491	684	1,533	0.548	0.630

HUDSON RIVER ABOVE FEEDER DAM NEAR GLENS FALLS, N. Y.

Water is diverted from the Hudson river to supply Champlain canal at a State dam located about two miles up-stream from Glens Falls. The gage was established in a pond above this dam by John R. Kaley, March 9, 1905. The gage is located about 400 feet up-stream from the left-hand end of the dam and consists of a vertical scale with painted tenth-foot marks reading from zero to 12 feet, attached to a pile about 30 feet from the river bank. The gage zero is at elevation 277.966. The dam, which has a crest length of 616 feet, is at a general elevation of about 280.9. Water-power was formerly extensively used by sawmills at this dam, now mostly abandoned. The gage is maintained by this Department in coöperation with the U. S. Weather Bureau. Gage readings are taken each morning and night by Albert B. Fisher.

Mean Daily Elevation of Water-surface (Barge Canal Datum) of Hudson River above Feeder Dam near Glens Falls, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	281.42	282.57	283.87	282.92	284.37	282.57	281.52	281.67	281.82	281.72	281.62	281.57
2	281.47	282.42	283.62	283.07	284.62	282.32	281.47	281.92	281.82	281.92	281.47	281.27
3	281.37	282.27	283.42	283.27	284.72	282.32	281.17	281.82	281.72	281.92	281.47	281.22
4	281.52	282.17	283.32	283.42	284.67	282.32	282.07	281.67	281.42	282.02	281.52	281.22
5	281.47	282.22	283.12	283.62	284.62	282.32	282.27	281.62	281.42	281.82	281.42	281.17
6	281.77	282.22	282.92	284.17	284.57	282.72	282.12	281.72	281.57	281.72	281.47	281.57
7	282.62	282.47	282.77	285.07	284.12	282.87	282.12	281.72	282.07	281.42	281.57	281.52
8	282.57	282.72	282.72	286.07	284.72	282.82	282.17	281.57	281.82	281.47	281.57	281.47
9	282.47	282.72	282.67	262.22	284.77	282.72	282.22	281.72	281.87	281.42	281.82	281.47
10	282.42	282.72	282.57	285.82	284.42	282.57	282.12	281.72	281.77	281.47	281.82	281.42
11	282.52	282.72	282.57	285.27	285.17	282.27	281.67	281.72	281.67	281.47	281.87	281.42
12	282.32	282.72	282.47	284.87	285.67	282.77	281.97	281.72	281.27	281.37	281.62	281.27
13	282.22	282.77	282.47	284.62	285.47	282.77	281.92	221.92	281.57	281.42	281.87	281.22
14	281.97	282.67	282.47	285.77	284.77	282.57	281.92	281.82	281.67	281.57	281.92	281.32
15	281.97	282.57	282.47	286.87	284.57	282.67	281.87	281.42	281.62	281.87	282.12	281.32
16	281.97	282.62	282.47	287.37	284.12	282.52	281.77	281.82	281.72	281.67	281.67	281.17
17	281.92	282.77	282.47	286.97	284.07	282.32	281.77	282.02	281.77	281.62	281.72	281.17
18	282.02	282.77	282.37	286.67	284.17	282.32	281.32	282.22	281.67	281.82	281.77	281.27
19	281.87	282.67	282.32	286.27	284.17	282.52	281.87	282.27	281.42	281.82	281.97	280.92
20	281.72	283.22	282.27	286.32	284.02	282.62	281.87	282.27	281.62	281.42	281.72	281.17
21	281.72	283.97	282.27	286.32	283.82	282.37	282.12	281.97	281.82	281.22	281.22	281.32
22	281.72	284.02	282.27	286.02	283.62	282.32	282.17	281.82	281.82	281.32	281.52	281.32
23	281.72	284.02	282.37	285.72	283.62	282.22	282.12	281.82	281.82	281.47	281.27	281.32
24	281.47	283.97	282.37	285.42	283.32	282.02	282.07	281.47	281.72	281.62	281.27	281.32
25	282.17	284.42	282.57	284.92	283.17	281.92	282.17	281.37	281.67	281.92	281.32	281.02
26	282.92	284.32	282.82	284.77	283.02	281.87	282.27	281.67	281.32	281.97	281.57	280.92
27	283.02	284.27	282.92	284.77	282.82	281.82	282.22	281.67	281.12	281.92	281.57	281.32
28	282.97	284.12	282.87	284.32	282.72	281.72	282.22	281.62	281.72	281.92	281.47	281.32
29	282.82	......	282.87	284.42	282.72	281.67	281.97	281.52	281.67	281.92	281.72	281.32
30	282.77	......	282.87	284.12	282.92	281.62	282.07	281.77	281.72	281.92	281.67	281.37
31	282.62	......	282.82	......	282.82	......	282.12	281.82	......	281.62	......	281.32

HUDSON RIVER AT CORINTH, N. Y.

A gaging station was established by this Department on Hudson river at Corinth October 1, 1906. Readings are taken each morning and night by E. H. Bowker. The record is maintained in coöperation with the U. S. Weather Bureau. Measurements of the flow at this point have been made by the U. S. Geological Survey. These measurements are connected to a gage which is read by the International Paper Company.

Mean Daily Gage Height, in Feet, of Hudson River at Corinth, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	0.20	1.45	3.20	1.80	4.05	1.55	0.20	0.00	−0.10	0.00	−0.10	0.05
2	0.20	1.25	2.95	2.15	4.50	1.15	0.20	−0.10	−0.10	0.00	−0.10	0.20
3	0.20	0.95	2.55	2.40	4.80	1.10	0.10	−0.20	−0.10	−0.05	−0.10	0.10
4	0.20	0.80	2.40	2.75	4.55	1.20	0.20	−0.20	−0.10	0.00	−0.15	0.10
5	0.30	0.85	2.00	3.30	4.45	1.35	0.20	−0.20	−0.20	0.00	−0.20	0.05
6	1.20	1.10	2.00	3.85	3.90	1.95	0.20	−0.20	−0.20	−0.10	−0.20	0.00
7	1.75	1.75	1.65	5.20	3.80	1.95	0.20	−0.20	−0.15	−0.20	−0.20	−0.05
8	1.70	1.80	1.50	6.50	4.10	1.80	0.10	−0.10	−0.20	−0.30	−0.05	−0.15
9	1.65	1.90	1.40	5.95	4.15	1.60	0.10	0.00	−0.25	−0.35	0.00	−0.30
10	1.55	1.65	1.35	5.75	4.15	1.40	0.00	0.00	−0.25	−0.30	−0.05	−0.30
11	1.50	1.60	1.50	5.25	5.35	1.90	0.00	0.00	−0.30	−0.20	−0.10	−0.20
12	1.40	1.55	1.35	4.55	6.20	1.75	0.00	0.00	−0.30	−0.10	−0.15	−0.20
13	1.40	1.45	1.30	4.60	5.30	1.60	0.00	−0.10	−0.20	−0.15	−0.10	−0.25
14	1.30	1.45	1.20	6.45	4.60	1.45	0.00	−0.10	−0.20	−0.30	−0.25	−0.10
15	1.30	1.50	1.10	7.95	4.15	1.45	0.00	−0.30	−0.15	−0.30	−0.10	−0.10
16	1.30	1.55	1.10	7.75	3.85	1.35	0.10	0.10	−0.15	−0.25	−0.20	−0.10
17	1.30	1.65	1.00	7.35	3.70	1.30	0.00	0.20	−0.10	−0.20	−0.10	−0.05
18	1.30	1.40	0.90	7.40	4.25	1.65	0.00	0.60	−0.20	−0.15	−0.10	−0.15
19	1.30	1.40	0.95	6.85	4.05	1.60	0.00	0.40	−0.20	−0.15	0.15	−0.20
20	1.30	2.25	1.00	6.95	3.55	1.45	0.10	0.10	−0.10	−0.10	0.05	−0.25
21	1.25	3.35	1.10	6.95	3.15	1.30	0.20	0.00	−0.20	−0.05	−0.15	−0.20
22	1.20	2.50	0.80	6.45	3.05	1.15	0.20	−0.30	−0.30	0.00	−0.05	−0.10
23	1.20	2.50	0.90	5.95	2.85	0.95	0.30	−0.20	−0.30	−0.05	0.00	−0.10
24	1.15	2.65	0.90	5.50	2.55	0.85	0.30	−0.30	−0.30	0.00	0.00	−0.20
25	1.50	4.10	1.30	4.75	2.45	0.80	0.30	−0.20	−0.20	−0.05	0.05	−0.30
26	2.10	4.05	1.75	4.45	2.20	0.70	0.20	−0.10	−0.20	−0.10	0.10	−0.30
27	2.10	4.10	1.95	4.25	1.70	0.40	0.10	0.00	−0.10	−0.10	0.15	−0.30
28	2.10	3.95	2.15	3.95	1.55	0.25	0.00	0.00	−0.05	0.00	0.15	−0.30
29	2.00	......	1.85	3.80	1.75	0.20	0.00	−0.10	0.00	0.00	0.35	−0.20
30	1.95	......	1.70	3.70	1.95	0.15	−0.10	−0.10	0.00	−0.15	0.10	−0.15
31	1.90	......	1.75	......	1.90	......	0.00	−0.10	......	−0.10	......	−0.10

SACANDAGA RIVER.

DESCRIPTION.

Sacandaga river is one of the larger tributaries of the upper Hudson. It drains extensive portions of the southeast slope of the Adirondack region as well as a portion of the plateau lying north of Mohawk river and south of the Adirondack mountains. The head waters of the stream arise in the slopes surrounding Lake Pleasant, Sacandaga and Piseco lakes. Above Northville the drainage basin is rugged and almost completely forest-covered. From Northville to Conklinville the stream winds through a sandy valley flanked by steep slopes. The width of this valley averages about one mile from Northampton to Conklinville. Above Northampton is an extensive flat lying at elevation about 740 feet. This flat is drained by Mayville, Vly and Hann's creeks, and contains extensive swamp areas. From Northville to Conklinville, a distance along the general course of the stream of about 22 miles, there is very little fall. The elevation at Conklinville is about 720 feet. Sacandaga river enters Hudson river at Lucerne at elevation about 540 feet. The distance from Conklinville to Luzerne is about seven miles along the general course of the stream.

SACANDAGA RIVER AT NORTHVILLE, N. Y.

Observations are taken once each day, beginning December 1, 1904. The observer is A. S. Pickard. A staff gage, 16 feet in length, is attached to the down-stream wing of west abutment of highway bridge near railroad station. The elevation of zero mark is 742.51. The water sometimes falls below the zero of this gage, and in such cases gage readings are taken from a scale attached to the down-stream side of center pier. This section reads from one foot above to four feet below the zero of the main gage. The station is maintained by this Department in coöperation with the U. S. Weather Bureau.

Mean Daily Gage Height, in Feet, of Sacandaga River at Northville, N. Y.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	-2.0	0.3	1.8	0.0	0.7	-1.5	-2.0	-2.2	-2.2	-2.5	-2.5	-1.6
2	-2.0	0.0	1.6	0.0	1.5	-1.7	-2.0	-2.3	-2.2	-2.5	-2.5	-1.6
3	-2.0	-0.2	1.1	0.2	0.5	-1.7	-1.9	-2.4	-2.2	-2.5	-2.5	-1.8
4	-2.0	-0.4	1.0	0.0	0.7	-1.8	-1.8	-2.4	-2.2	-2.6	-2.5	-1.8
5	-2.0	-0.3	0.8	-0.4	0.5	-1.8	-1.9	-2.4	-2.1	-2.6	-2.5	-2.0
6	0.0	-0.1	0.5	0.0	0.1	-0.8	-2.0	-2.4	-2.1	-2.6	-2.5	-2.2
7	1.0	1.5	0.4	2.2	0.2	-1.1	-2.0	-2.4	-2.1	-2.6	-2.5	-2.3
8	0.0	1.6	0.2	3.0	0.2	-1.4	-2.0	-2.4	-2.1	-2.6	-2.5	-2.3
9	-0.1	1.2	0.0	2.0	0.0	-1.7	-2.1	-2.4	-2.2	-2.6	-2.5	-2.3
10	-0.2	1.1	0.2	0.8	0.0	-1.8	-2.1	-2.4	-2.2	-2.6	-2.5	-2.3
11	-0.4	1.4	0.4	0.0	1.5	-1.0	-2.1	-2.4	-2.1	-2.6	-2.5	-2.3
12	-0.5	1.3	0.2	0.0	0.8	-1.2	-2.2	-2.1	-2.0	-2.6	-2.5	-2.3
13	-0.5	1.1	0.2	0.4	0.5	-1.5	-2.2	-2.1	-2.0	-2.6	-2.5	-2.3
14	-0.6	0.9	0.1	4.0	0.0	-1.2	-2.2	-2.1	-2.1	-2.6	-2.5	-2.3
15	-0.9	0.6	0.0	3.9	-0.2	-1.3	-2.3	-2.1	-2.1	-2.6	-2.5	-2.1
16	-0.9	1.8	-0.1	3.2	-0.5	-1.4	-2.1	-2.0	-2.6	-2.6	-2.5	-2.0
17	-0.9	2.0	-0.2	2.5	0.5	-1.7	-2.1	-1.3	-2.6	-2.4	-2.4	-1.9
18	-0.8	1.7	-0.3	2.3	0.0	-1.4	-2.1	-1.5	-2.6	-2.5	-2.2	-2.0
19	-0.8	1.6	-0.4	2.0	-0.5	-1.3	-2.1	-1.5	-2.6	-2.5	-2.2	-2.0
20	-0.8	3.9	-0.2	3.5	-0.5	-1.4	-2.0	-1.7	-2.6	-2.5	-2.2	-2.0
21	-0.7	4.5	-0.5	2.0	-0.7	-1.6	-2.1	-1.9	-2.6	-2.5	-2.4	-2.0
22	-0.7	3.2	-0.5	2.2	-0.9	-1.8	-2.2	-2.2	-2.6	-2.2	-2.4	-2.0
23	-0.7	2.4	-0.6	2.1	-1.0	-1.9	-2.3	-2.4	-2.6	-2.2	-2.2	-2.0
24	-0.5	2.4	-0.5	1.5	-1.1	-2.0	-1.7	-2.4	-2.6	-2.2	-2.0	-2.1
25	1.0	4.5	-0.1	1.0	-1.2	-2.1	-1.7	-2.2	-2.6	-2.2	1.0	-2.1
26	2.0	3.1	0.6	1.0	-1.4	-2.1	-1.8	-2.0	-2.6	-2.3	0.0	-2.1
27	1.7	2.6	0.4	0.8	-1.5	-2.2	-1.8	-2.0	-2.6	-2.4	-1.0	-2.1
28	1.3	1.9	0.1	0.8	-1.3	-2.3	-1.9	-2.0	-2.5	-2.4	-1.0	-2.1
29	1.0	......	0.2	0.7	-1.3	-2.3	-2.0	-2.1	-2.5	-2.4	-1.4	-2.1
30	0.5	......	0.1	0.5	-1.3	-2.4	-2.1	-2.2	-2.5	-2.4	-1.6	-2.2
31	0.6	......	0.0	......	-1.5	......	-2.2	-2.2	......	-2.5	......	-2.2

INDIAN RIVER AT INDIAN LAKE, N. Y.

A record of the stage of water in Indian lake reservoir, located in the upper Hudson river basin, as described in preceding reports, has been continued. The stage of water in the reservoir is shown in the following table:

Mean Daily Gage Height, in Feet, of Indian Lake Reservoir at Indian Lake, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	4.00	8.46	16.83	18.33	34.67	34.25	33.92	30.58	22.67	13.75	7.33	4.00
2	3.92	8.58	17.00	18.42	34.58	34.25	33.88	30.46	22.33	13.50	7.17	4.00
3	3.83	8.71	17.13	18.50	34.50	34.25	33.83	30.25	22.00	13.25	7.00	4.00
4	3.71	8.83	17.33	18.67	34.29	34.21	33.83	30.04	21.67	13.08	6.83	4.00
5	3.67	8.96	17.58	18.79	34.13	34.25	33.83	29.83	21.33	12.92	6.67	4.00
6	4.04	9.25	17.75	19.00	34.17	34.33	33.79	29.67	21.00	12.79	6.50	4.00
7	4.33	9.50	17.92	19.58	34.75	34.42	33.75	29.29	20.69	12.67	6.03	3.96
8	4.67	9.75	18.00	20.42	35.08	34.38	33.71	28.92	20.33	12.42	6.17	3.92
9	5.00	10.00	18.08	21.17	35.33	34.38	33.67	28.54	20.00	12.17	6.00	3.83
10	5.17	10.38	18.17	21.58	35.58	34.33	33.67	28.17	19.67	11.92	5.83	3.75
11	5.33	10.63	18.21	21.96	36.17	34.33	33.58	27.79	19.33	11.67	5.67	3.67
12	5.50	10.88	18.25	22.21	36.17	34.33	33.50	27.42	19.00	11.42	5.50	3.58
13	5.63	11.08	18.25	22.67	36.00	34.38	33.33	27.04	18.67	11.17	5.33	3.50
14	5.71	11.29	18.25	23.83	35.67	34.42	33.08	26.71	18.38	10.92	5.17	3.42
15	5.79	11.54	18.29	25.33	35.50	34.38	32.92	26.38	18.13	10.67	5.00	3.42
16	5.92	11.83	18.33	26.33	35.29	34.33	32.75	26.17	17.88	10.46	4.83	3.42
17	6.00	12.08	18.42	27.25	35.17	34.33	32.58	25.92	17.63	10.25	4.67	3.42
18	6.08	12.29	18.50	28.17	35.00	34.38	32.42	25.79	17.33	9.96	4.50	3.33
19	6.17	12.50	18.54	29.00	34.04	34.38	32.21	25.83	17.00	9.67	4.33	3.25
20	6.25	13.00	18.54	30.00	34.92	34.38	32.00	25.83	16.67	9.42	4.17	3.17
21	6.21	13.63	18.38	30.79	34.83	34.33	31.88	45.83	16.33	9.21	4.00	3.17
22	6.13	14.17	18.25	31.54	34.75	34.29	31.67	25.83	16.04	9.00	4.17	3.08
23	6.17	14.67	18.13	32.25	34.67	34.25	31.50	25.79	15.75	8.83	3.83	2.92
24	6.29	15.08	18.04	32.08	34.58	34.21	31.38	25.58	15.50	8.67	4.00	2.83
25	6.83	15.58	18.00	33.29	34.54	34.17	31.42	25.25	15.25	8.50	4.00	2.75
26	7.17	16.00	17.96	33.58	34.50	34.08	31.38	24.92	15.00	8.33	4.00	2.67
27	7.50	16.38	17.96	34.00	34.46	34.00	31.38	24.54	14.75	8.17	4.00	2.58
28	7.79	16.63	18.08	34.42	34.42	33.96	31.38	24.17	14.50	8.00	4.00	2.50
29	8.08	......	18.17	34.67	34.42	33.92	31.17	23.79	14.25	7.83	4.00	2.42
30	8.29	......	18.21	39.75	34.33	33.92	31.00	23.42	14.00	7.67	4.00	2.33
31	8.33	......	18.25	......	34.25	......	30.79	23.04	......	7.50	......	2.25

DELAWARE RIVER DRAINAGE BASIN.

DESCRIPTION OF DELAWARE RIVER.

The head waters of Delaware river rise in Delaware, Greene and Schoharie counties, N. Y., the source of the main stream, which is commonly known as West branch, to distinguish it from the smaller East or Pepacton branch, being a small lake almost on the line of Schoharie and Delaware counties, at an elevation of 1,886 feet above tide. From this lake it flows southwestward across central Delaware county to Deposit, where it receives Oquaga creek, a large tributary draining eastern Broome county, and turns abruptly to the southeast, forming the boundary line between New York and Pennsylvania until Port Jervis is reached. Here it turns again to the southwest and flows for a distance of about 40 miles along the base of the Shawangunk range until it passes throught the water gap, from which point it flows irregularly southward to Trenton. Below Trenton the course is in general southwestward to Delaware Bay. South of Port Jervis it forms the dividing line between Pennsylvania and New Jersey, and for a few miles it is the boundary between Delaware and New Jersey.

East branch rises at Grand Gorge in northeastern Delaware county, and flows parallel to West branch across southern Delaware county, uniting with the latter stream at Hancock.

The total length of the river from the mouth to the head of West branch is about 410 miles; its drainage area, measured at Philadelphia and including Schuylkill river, is 10,100 square miles, of which about 2,580 square miles lie in New York, 5,750 in Pennsylvania, and 1,800 in New Jersey. The river is tidal to Trenton, which lies also at the head of navigation.

EAST BRANCH, DELAWARE RIVER, AT HANCOCK, N. Y.

This station was established October 14, 1902, by Robert E. Horton, and has since been maintained by the U. S. Geological Survey in coöperation with this Department. It is located at the highway bridge one-half mile southeast of the Erie railroad station at Hancock, N. Y., and one mile above the junction with West branch of the Delaware. The Erie railroad bridge is just below the station.

The channel is straight for 600 feet above and 300 feet below the station. The current is swift. Both banks are of medium height and are not liable to overflow. The bed of the stream is composed of rocks and gravel. There are three channels at low water and five channels at high water. During low water the elevation of the water-surface at the station is lower than the water-surface on West branch of the Delaware, but the gage heights are probably not affected by backwater from West branch, as there is considerable fall between the gaging station and the junction of the branches.

Discharge measurements are made from the down-stream side of the five-span iron highway bridge to which the gage is attached. The bridge has a total span of 425.5 feet between abutments. The initial point for soundings is the face of the right abutment at the top.

A standard chain gage is attached to the lower chord of the second span from the left end of the bridge on the up-stream side. It was installed July 21, 1903, to replace the old wire gage. The gage datum was not changed. The length of the chain from the end of the weight to the marker is 32.43 feet. The gage is read twice each day by D. B. Van Etten. The bench-mark is a circular chisel draft on the top of the left abutment on the down-stream side. It is marked "B. M." Its elevation is assumed to be 100.00. The elevation of the top of the gage pulley is 104.47. The elevation of water-surface, when the gage reads zero, is 72.07.

Mean Daily Gage Height, in Feet, of East Branch, Delaware River, at Hancock, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	3.8	3.5	4.7	4.7	5.3	3.3	3.0	2.7	2.5	2.6	2.6	2.9
2	3.8	3.5	4.7	4.7	6.3	3.3	3.0	2.5	2.4	2.5	2.5	2.9
3	4.2	3.5	4.5	4.8	5.5	3.2	2.9	2.6	2.5	2.6	2.5	2.9
4	4.7	3.9	4.4	5.0	6.2	3.2	2.9	2.5	2.4	2.5	2.4	2.8
5	5.8	3.8	4.2	4.9	6.0	3.3	2.9	2.6	2.5	2.5	2.5	2.7
6	13.3	3.9	3.9	4.8	5.5	3.6	2.8	2.5	2.5	2.5	2.5	2.7
7	8.1	5.3	4.1	5.4	5.2	3.5	2.8	2.4	2.4	2.4	2.4	2.9
8	5.8	4.5	3.9	5.8	5.1	3.3	2.8	2.5	2.5	2.5	2.5	2.7
9	5.2	4.2	3.8	5.4	4.8	3.2	2.7	2.4	2.4	2.4	2.5	2.9
10	4.9	4.0	3.9	4.9	4.5	3.2	2.7	2.5	2.5	2.5	2.6	2.9
11	4.6	5.7	5.9	4.7	8.1	3.5	2.7	2.4	2.5	2.5	2.5	2.9
12	4.5	4.5	4.9	4.4	6.1	3.6	2.7	2.3	2.5	2.5	2.4	2.8
13	4.1	4.5	4.8	4.3	5.4	3.4	2.6	2.4	2.5	2.6	2.5	2.9
14	3.9	4.6	4.5	4.8	5.0	3.8	2.6	2.3	2.4	2.5	2.4	3.1
15	4.1	4.4	4.4	7.1	4.9	3.8	2.6	2.4	2.5	2.6	2.5	4.2
16	4.1	5.3	4.2	7.0	4.7	3.9	2.6	2.5	2.5	2.5	2.5	3.6
17	3.9	7.0	4.1	6.0	4.6	3.6	2.7	2.5	2.4	2.4	2.4	3.7
18	3.9	5.7	4.1	5.5	4.7	3.8	2.6	3.5	2.5	2.5	2.5	3.7
19	3.8	5.2	3.9	5.1	4.4	4.1	2.7	2.9	2.4	2.4	2.4	3.5
20	3.6	11.1	3.9	4.9	4.3	3.8	2.7	2.8	2.5	2.5	2.6	3.3
21	3.9	8.2	3.7	4.7	4.1	3.7	2.7	2.9	2.5	2.5	2.5	3.6
22	3.8	6.4	3.8	4.6	4.1	3.6	2.6	2.7	2.4	2.5	2.4	3.5
23	3.7	5.7	3.6	4.5	4.0	3.5	2.7	2.7	2.5	2.6	2.5	3.6
24	4.0	5.6	3.6	4.7	3.9	3.5	2.8	2.5	2.5	2.5	2.5	3.8
25	6.1	7.9	3.8	4.4	3.8	3.4	3.0	2.6	2.6	2.6	3.0	3.8
26	5.7	5.9	6.4	4.4	3.7	3.3	2.8	2.6	2.6	2.7	2.8	3.8
27	5.0	5.6	5.1	4.4	3.6	3.2	2.8	2.6	2.4	2.5	2.8	3.7
28	4.7	5.3	5.4	4.4	3.7	3.2	2.7	2.6	2.6	2.6	2.8	3.7
29	4.4	......	5.4	4.5	3.7	3.1	2.7	2.5	2.5	2.5	2.7	3.6
30	4.4	......	5.0	4.5	3.6	3.1	2.7	2.6	2.7	2.6	3.1	3.7
31	4.1	......	4.7	......	3.4	......	2.7	2.4	......	2.5	......	3.5

Current-meter Discharge Measurements of East Branch, Delaware River, at Hancock N. Y

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
1909.		*Feet.*	*Feet.*	*Square feet.*	*Second-feet.*
July 22	Covert and James	2.64	267	290	222
Nov. 18	Hoyt and Covert	2.46	120	89	138

NOTE.—Measurements made by wading.

Mean Daily Discharge, Second-feet, of East Branch, Delaware River, at Hancock, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	250	970	3,230	3,230	4,740	725	440	248	153	198	198	367
2	250	970	3,230	3,230	7,690	725	440	153	113	153	153	367
3	300	970	2,780	3,470	5,280	620	367	198	153	198	153	367
4	300	1,590	2,560	3,960	7,360	620	367	153	113	153	113	304
5	5,000	1,420	2,120	3,710	6,740	725	367	198	153	153	153	248
6	22,000	1,590	1,590	3,470	5,280	1,110	304	153	153	153	153	248
7	14,600	4,740	1,960	5,010	4,480	970	304	113	113	113	113	367
8	6,140	2,780	1,590	6,140	4,220	725	304	153	153	153	153	248
9	4,480	2,150	1,420	5,010	3,470	620	248	113	113	113	153	367
10	3,710	1,770	1,590	3,710	2,780	620	248	153	153	153	198	367
11	3,000	5,850	6,440	3,230	14,600	970	248	113	153	153	153	367
12	2,000	2,780	3,710	2,560	7,040	1,110	248	80	153	153	113	304
13	1,200	2,780	3,470	2,350	5,010	840	198	113	153	198	153	367
14	1,100	3,000	2,780	3,470	3,960	1,420	198	80	113	153	113	525
15	900	2,560	2,560	10,600	3,710	1,420	198	113	153	198	153	2,150
16	1,500	4,740	2,150	10,200	3,230	1,590	198	153	153	153	153	1,110
17	1,100	10,200	1,960	6,740	3,000	1,110	248	153	113	113	113	800
18	1,000	5,850	1,960	5,280	3,230	1,420	198	970	153	153	153	700
19	800	4.480	1,590	4,220	2,560	1,960	248	367	113	113	113	500
20	800	30,100	1,590	3,710	2,350	1,420	248	304	153	153	198	400
21	1,200	15,800	1,260	3,230	1,960	1,260	248	367	153	153	153	400
22	1,420	8,020	1,420	3,000	1,960	1,110	198	248	113	153	113	400
23	1,200	5,850	1,110	2,780	1,770	970	248	248	153	198	153	300
24	1,770	5,560	1,110	3,230	1,590	970	304	153	153	153	153	300
25	7,040	13,800	1,420	2,560	1,420	840	440	198	198	198	440	300
26	5,850	6,440	8,020	2,560	1,260	725	304	198	198	248	304	250
27	3,960	5,560	4,220	2,560	1,110	620	304	198	113	153	304	250
28	3 230	4,740	5,010	2,560	1,260	620	248	198	198	198	304	200
29	2,560	......	5,010	2,780	1,260	525	248	153	153	153	248	150
30	2,100	......	3,960	2,780	1,110	525	248	198	248	198	525	150
31	1,960	......	3,230	......	840	......	248	113	......	153	......	150

NOTE.— Daily discharge, January 1–6, 12–21, 23 and 30, also December 17–31, estimated on the basis of discharge at other Delaware river stations. Daily discharges for the remainder of the year based on a well defined rating curve.

Monthly Discharge of East Branch, Delaware River, at Hancock, N. Y.
[Drainage area, 920 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	22,000	250	3,310	3.60	4.15
February	30,100	970	5,610	6.10	6.35
March	8,020	1,110	2,780	3.02	3.48
April	10,600	2,350	4,040	4.39	4.90
May	14,600	840	3,750	4.08	4.70
June	1,960	525	963	1.05	1.17
July	440	198	279	.303	.35
August	970	80	205	.223	.26
September	248	113	149	.162	.18
October	248	113	163	.177	.20
November	525	113	188	.204	.23
December	2,150	150	430	.467	.54
The year	30,100	80	1,820	1.98	26.51

WEST BRANCH, DELAWARE RIVER, AT HANCOCK, N. Y.

This station was established October 15, 1902, by Robert E. Horton, and has since been maintained by the U. S. Geological Survey in coöperation with this Department. It is located one-half mile west of the Erie railroad station at Hancock, N. Y., and about one mile above the mouth of East branch.

The channel is straight for 400 feet above and 800 feet below the bridge. The current is swift. Both banks are high and rocky and are not subject to overflow. The bed of the stream is composed of earth and cobblestones.

Discharge measurements are made from the down-stream side of the bridge, at which the gage is located. The bridge has a single span of 235 feet. The initial point for soundings is the top of the face of the left abutment on the down-stream side. The bridge floor is marked at intervals of five feet with black paint.

The original wire gage was attached to the up-stream side of the bridge. It was replaced July 20, 1903, by a standard chain gage. The location and the gage datum were not changed. The length of the chain from the end of the weight to the marker is 30.44 feet. The gage is read twice each day by David Pulver, the collector of tolls at the bridge. The bench-mark is a circular chisel draft on the up-stream corner of the left abutment. Its elevation is assumed at 100.00. The elevation of the top of the pulley is 106.29. The elevation of water-surface, when the gage reads zero, is 75.75.

Mean Daily Gage Height, in Feet, of West Branch, Delaware River, at Hancock, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	4.3	3.9	4.7	4.8	5.9	3.2	3.2	2.7	2.5	2.4	2.4	2.5
2	4.0	3.2	4.6	4.8	6.4	3.2	3.1	2.5	2.4	2.8	2.5	2.4
3	4.2	3.9	4.6	4.5	5.8	3.2	3.1	2.6	2.4	2.3	2.5	2.7
4	4.5	3.9	4.4	5.1	6.6	3.1	3.0	2.6	2.4	2.3	2.4	2.8
5	5.1	4.0	3.9	4.8	6.3	3.3	3.1	2.5	2.4	2.4	2.4	2.8
6	9.5	4.6	3.8	4.8	5.8	3.8	3.1	2.9	2.4	2.4	2.4	2.7
7	7.2	6.0	4.0	5.2	5.6	3.5	2.8	2.5	2.4	2.4	2.5	2.5
8	5.7	4.7	3.8	5.2	5.2	3.3	2.9	2.5	2.4	2.4	2.5	2.7
9	5.2	4.4	3.8	5.0	4.4	3.2	2.8	2.6	2.4	2.4	2.4	2.6
10	5.1	4.0	3.8	4.8	4.7	3.2	2.7	2.5	2.5	2.4	2.4	2.5
11	4.6	5.5	6.9	4.5	5.1	4.7	2.9	2.4	2.7	2.5	2.5	2.7
12	4.6	4.4	5.1	4.3	5.5	4.3	2.8	2.4	2.6	2.7	2.4	2.5
13	3.8	4.3	4.8	4.3	5.0	4.0	2.6	2.4	2.4	2.8	2.4	2.6
14	3.7	4.5	4.7	5.1	4.8	5.0	2.6	2.4	2.4	2.6	2.4	3.5
15	3.2	4.5	4.5	7.3	5.0	4.7	2.7	2.5	2.5	2.6	2.4	3.8
16	4.0	5.3	4.2	7.0	5.7	4.4	2.5	2.7	2.5	2.5	2.4	3.6
17	4.1	7.0	4.1	6.1	4.5	4.2	2.6	3.2	2.4	2.5	2.4	3.3
18	3.6	5.6	3.9	5.6	4.7	5.9	3.0	3.0	2.4	2.5	2.4	3.2
19	3.6	5.2	3.8	5.2	4.4	5.2	3.0	2.8	2.5	2.5	2.4	3.3
20	3.6	9.0	3.8	5.3	4.2	4.8	2.8	3.0	2.3	2.4	2.4	3.0
21	4.2	8.0	3.6	4.9	4.0	4.4	2.7	2.8	2.3	2.4	2.4	3.0
22	4.1	6.4	3.7	5.0	4.0	4.2	2.7	2.6	2.3	2.5	2.5	3.4
23	4.1	5.8	3.6	4.7	3.9	4.2	2.9	2.6	2.3	2.5	2.5	3.3
24	4.4	6.0	3.4	4.6	3.8	4.3	3.0	2.6	2.4	2.5	2.4	3.1
25	7.6	7.8	4.1	4.4	3.8	3.9	3.0	2.6	2.5	2.5	2.5	3.1
26	6.3	6.0	6.2	4.4	3.6	3.8	3.2	2.6	2.4	2.5	2.7	3.2
27	5.7	5.6	5.2	4.4	3.4	3.5	2.8	2.6	2.4	2.5	2.5	3.0
28	5.0	5.4	5.6	4.2	3.6	3.5	2.7	2.6	2.4	2.5	2.9	3.0
29	4.5	......	5.6	4.3	3.7	3.3	2.6	2.6	2.3	2.5	2.6	3.2
30	4.0	......	5.1	4.4	3.5	3.2	2.7	2.5	2.4	2.5	2.8	3.2
31	4.0	......	5.0	......	3.4	......	2.6	2.5	......	2.5	......	3.1

NOTE.— Probable ice conditions during the greater part of January and February 1–5 also December 19–31.

Current-meter Discharge Measurements of West Branch, Delaware River, at Hancock, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
		Feet.	*Feet.*	*Square feet.*	*Second-feet.*
July 21*a*....	Covert and James..................	2.75	190	168	155
Nov. 18*a*....	Hoyt and Covert....................	2.42	72	74	51

a Measurements made at wading section.

Mean Daily Discharge, Second-feet, of West Branch, Delaware River, at Hancock, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	150	890	1,970	2,130	4,440	348	348	127	67	46	46	67
2	150	348	1,810	2,130	5,780	348	297	67	46	30	67	46
3	200	890	1,810	2,470	4,190	348	297	95	46	30	67	127
4	200	890	1,520	2,650	6,340	297	250	95	46	30	46	163
5	2,650	1,000	890	2,130	5,500	404	297	67	46	46	46	163
6	14,000	1,810	790	2,130	4,190	790	297	204	46	46	46	127
7	8,120	4,700	1,000	2,840	3,700	538	163	67	46	46	67	67
8	3,940	1,970	790	2,840	2,840	404	204	67	46	46	67	127
9	2,840	1,520	790	2,470	1,520	348	163	95	46	46	46	95
10	2,650	1,000	790	2,130	1,970	348	127	67	67	46	46	67
11	1,810	3,470	7,210	1,660	2,650	1,970	204	46	127	67	67	127
12	1,200	1,520	2,650	1,380	3,470	1,380	163	46	95	127	46	67
13	790	1,380	2,130	1,380	2,470	1,000	95	46	46	163	46	95
14	700	1,660	1,970	2,650	2,130	2,470	95	46	46	95	46	538
15	348	1,660	1,660	8,430	2,470	1,970	127	67	67	95	46	790
16	1,000	3,040	1,250	7,510	3,940	1,520	67	127	67	67	46	615
17	800	7,510	1,120	4,960	1,660	1,250	95	348	46	67	46	404
18	615	3,700	890	3,700	1,970	4,440	250	250	46	67	46	348
19	500	2,840	790	2,840	1,520	2,840	250	163	67	67	46	300
20	500	14,100	790	3,040	1,250	2,130	163	250	30	46	46	200
21	800	10,700	615	2,300	1,000	1,520	127	163	30	46	46	200
22	1,000	5,780	700	2,470	1,000	1,250	127	95	30	67	67	200
23	900	4,190	615	1,970	890	1,250	204	95	30	67	67	150
24	1,520	4,700	468	1,810	790	1,380	250	95	46	67	46	150
25	5,000	10,000	1,120	1,520	790	890	250	95	67	67	67	100
26	4,000	4,700	5,230	1,520	615	790	348	95	46	67	127	100
27	2,500	3,700	2,840	1,520	468	538	163	95	46	67	67	100
28	2,100	3,250	3,700	1,250	615	538	127	95	46	67	204	100
29	1,660	......	3,700	1,380	700	404	95	95	30	67	95	75
30	1,000	......	2,650	1,520	538	348	127	67	46	67	163	75
31	1,000	......	2,470	......	468	......	95	67	......	67	......	75

NOTE.— Daily discharge for open water conditions based on a fairly well defined rating curve. Discharge for January 1–4, 12, 17, 19–23, 24–28, and December 19–31 corrected for ice conditions by comparison of discharge at Delaware river stations. Other days in January and February 1–4 were probably more or less affected by ice conditions.

Monthly Discharge of West Branch, Delaware River, at Hancock, N. Y.

[Drainage area, 680 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	14,000	150	2,090	3.07	3.54
February	14,100	348	3,680	5.41	5.63
March	7,210	468	1,830	2.69	3.10
April	8,430	1,250	2,620	3.85	4.30
May	6,340	468	2,320	3.41	3.93
June	4,440	297	1,140	1.68	1.87
July	348	67	189	.278	.32
August	348	46	110	.162	.19
September	127	30	51.9	.076	.08
October	163	30	64.2	.094	.11
November	204	46	65.8	.097	.11
December	790	46	189	.278	.32
The year	14,100	30	1,200	1.76	23.50

DELAWARE RIVER AT PORT JERVIS, N. Y.

This station is located at the toll bridge over the Delaware river at Port Jervis. It was established for the United States Weather Bureau by Irving Righter, City Engineer, Port Jervis, N. Y., October 12, 1904.

This station is maintained for the purpose of flood predictions by the Weather Bureau and the records of gage heights are supplied to the Geological Survey for the purpose of determining the regimen of flow of the upper Delaware drainage.

Mongaup river enters the Delaware from the north about 6 miles above the station and Neversink river, also from the north, enters about one mile below the station.

The river section is affected by ice to a greater or less extent each winter.

Considerable difficulty has been experienced in maintaining the datum of the chain gage constant. On September 4, 1908, a careful investigation was made and in order to avoid negative readings a change in the original datum of about 2 feet, as nearly as it could be determined, was made. The new chain length set on this date was 36.47 feet from rivet marker to the end of the weight. The relation between the gage datum and the following bench-marks was determined:

Port Jervis city bench-mark, from which the gage was originally established, is a cross located on the door-sill of the schoolhouse on Thompson street near Water street. Elevation above gage datum, 27.75 feet.

Bench-mark No. 2, top of down-stream left corner of pier of toll bridge, elevation above gage datum, 29.92 feet.

Bench-mark No. 3, top of right abutment of toll bridge at apex of angle caused by junction of down-stream wing-wall. Elevation above gage datum, 29.02 feet. The elevation of the datum of the gage is 414.89 feet above mean sea level.

Conditions of flow at this point are constant and a good rating table has been developed for low and medium stages. Careful comparisons of this station with the Riegelsville and the two Hancock stations indicate that the corrections applied to the gage heights were essentially correct and that the discharge data can be fully relied on.

The maximum flood crest discharge at this station occurred October 10, 1903, and is estimated to have been about 155,000 second-feet, or 47.7 second-feet per square mile. The crest stage was equivalent to 23.3 feet on the gage and is believed to have been the highest stage caused by free flow without ice for more than a century. A stage of 25.5 feet was recorded in March, 1904, due to an ice gorge.

Mean Daily Gage Height, in Feet, of Delaware River at Port Jervis, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	2.5	3.4	5.6	5.0	6.5	2.8	2.5	1.5	1.0	1.1	1.1	1.5
2	2.5	2.9	5.1	4.8	8.5	2.8	2.4	1.5	1.0	1.0	1.1	1.5
3	2.5	2.8	4.7	4.4	7.5	2.4	2.2	1.4	1.9	1.0	1.1	1.5
4	2.4	3.2	4.7	4.0	7.2	2.0	2.1	1.4	.9	1.0	1.1	1.4
5	2.8	3.2	4.4	5.1	7.5	2.7	1.9	1.4	.9	.8	1.0	1.4
6	9.6	3.4	4.1	4.4	7.6	3.6	1.7	1.4	.9	.8	1.0	1.4
7	10.0	6.2	4.0	4.1	7.0	3.6	1.7	1.3	.9	.8	1.0	1.3
8	6.8	5.1	4.0	5.5	7.4	3.4	1.7	1.2	.9	.8	1.0	1.5
9	5.6	4.4	3.8	5.2	6.8	2.8	1.7	1.2	.9	.8	.9	1.4
10	5.2	4.0	3.8	5.0	5.4	3.0	1.6	1.2	.9	.8	.9	1.3
11	4.7	4.8	6.8	4.6	6.6	3.2	1.6	1.3	1.2	.8	.9	1.3
12	4.5	5.3	5.8	4.1	7.0	3.6	1.4	1.3	1.1	.8	.8	1.3
13	4.3	4.5	5.2	3.9	6.0	3.4	1.4	1.3	1.0	1.0	.8	1.5
14	3.8	4.7	5.0	3.9	5.2	4.0	1.4	1.2	1.0	1.0	.8	2.3
15	3.5	5.0	4.7	7.6	4.8	4.0	1.4	1.2	1.0	1.2	1.0	3.0
16	3.7	5.5	4.5	8.4	5.0	4.0	1.4	1.2	1.0	1.2	1.0	3.3
17	3.9	8.4	4.2	7.6	4.7	3.8	1.8	1.4	1.2	1.1	1.1	3.1
18	3.1	7.5	4.0	7.0	4.5	4.1	1.5	1.8	1.1	1.0	1.1	2.8
19	2.8	6.7	4.0	6.8	4.3	4.8	1.5	2.2	1.0	.9	1.1	2.7
20	2.7	9.2	3.8	6.4	4.0	4.2	1.8	2.0	.9	.9	1.1	2.7
21	2.7	17.7	3.6	5.6	3.6	4.0	1.6	1.9	.9	.9	.9	2.7
22	3.1	8.4	3.5	5.1	3.8	3.6	1.5	1.8	.9	1.0	.9	2.6
23	3.2	7.1	3.2	5.0	3.6	3.2	1.7	1.6	.9	1.0	.8	2.6
24	3.2	7.2	3.0	5.3	3.4	3.0	1.8	1.6	1.0	1.0	.8	2.5
25	6.7	9.3	3.5	5.0	3.0	2.7	1.9	1.4	1.0	1.2	1.4	2.5
26	6.8	7.8	7.5	4.5	2.7	2.7	1.9	1.3	1.0	1.2	1.4	2.5
27	5.8	6.6	6.5	4.5	3.2	2.7	1.9	1.3	1.0	1.2	1.0	2.3
28	5.2	6.2	6.4	4.4	3.2	2.7	1.7	1.3	1.2	1.1	1.0	2.3
29	4.6	......	6.0	4.2	3.4	2.5	1.6	1.2	1.3	1.1	1.5	2.6
30	4.2	......	5.7	5.0	3.2	2.5	1.6	1.2	1.2	1.1	1.3	2.6
31	4.0	......	5.3	......	3.0	......	1.5	1.0	......	1.0	......	2.3

NOTE.— Ice conditions, January 1-5 and December 19-31.

Current-meter Discharge Measurements of Delaware River at Port Jervis, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
1909.		*Feet.*	*Feet.*	*Square feet*	*Second-feet.*
Aug. 23	W. G. Hoyt	1.65	498	1,590	879
Nov. 16	Hoyt and Covert	.9	264	610	354
Nov. 17	Hoyt and Covert	1.07	263	689	432

Mean Daily Discharge, Second-feet, of Delaware River at Port Jervis, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1,000	4,360	12,400	9,830	16,900	2,840	2,190	765	390	455	455	765
2	1,000	3,070	10,200	9,020	28,800	2,840	2,000	765	390	390	455	765
3	1,000	2,840	8,630	7,520	22,500	2,000	1,650	680	330	390	455	765
4	1,200	3,820	8,630	6,140	20,700	1,340	1,490	680	330	390	455	680
5	1,800	3,820	7,520	10,200	22,500	2,610	1,200	680	330	275	390	680
6	36,300	4,360	6,470	7,520	22,500	4,920	960	680	330	275	390	680
7	38,100	15,300	6,140	6,470	19,600	4,920	960	600	330	275	390	600
8	18,500	10,200	6,140	12,000	21,900	4,360	960	525	330	275	390	765
9	12,400	7,520	5,510	10,700	18,500	2,840	960	525	330	275	330	680
10	10,700	6,140	5,510	9,830	11,500	3,310	855	525	330	275	330	600
11	8,630	9,020	18,500	8,250	17,400	3,820	855	600	525	275	330	600
12	7,880	11,100	13,400	6,470	19,600	4,920	680	600	455	275	275	600
13	7,160	7,880	10,700	5,820	14,300	4,360	680	600	390	390	275	765
14	5,510	8,630	9,830	5,820	10,700	6,140	680	525	390	390	275	1,820
15	4,640	9,830	8,630	23,100	9,020	6,140	680	525	390	525	390	3,310
16	5,210	12,000	7,880	28,100	9,830	6,140	680	525	390	525	390	4,090
17	5,820	28,100	6,810	23,100	8,630	5,510	1,080	680	525	455	455	3,560
18	3,560	22,500	6,140	19,600	7,880	6,470	765	1,080	455	390	455	2,840
19	2,840	17,900	6,140	18,500	7,160	9,020	765	1,650	390	330	455	2,200
20	2,610	33,500	5,510	16,300	6,140	6,810	1,080	1,340	330	330	455	1,700
21	2,610	101,000	4,920	12,400	4,920	6,140	855	1,200	330	330	330	1,400
22	3,560	28,100	4,640	10,200	5,510	4,920	765	1,080	330	390	330	1,200
23	3,820	20,200	3,820	9,830	4,920	3,820	960	855	330	390	275	1,200
24	3,820	20,700	3,310	11,100	4,360	3,310	1,080	855	390	390	275	1,000
25	17,900	34,200	4,640	9,830	3,310	2,610	1,200	680	390	525	680	1,000
26	18,500	24,300	22,500	7,880	2,610	2,610	1,200	600	390	525	680	1,000
27	13,400	17,400	16,900	7,880	3,820	2,610	1,200	600	390	525	390	800
28	10,700	15,300	16,300	7,520	3,820	2,610	960	600	525	455	390	800
29	8,250	......	14,300	6,810	4,360	2,190	855	525	600	455	765	800
30	6,810	......	12,900	9,830	3,820	2,190	855	525	525	455	600	700
31	6,140	......	11,100	......	3,310	......	765	390	......	390	......	600

NOTE.— Daily discharge, January 1–5, and December 19–31, estimated on the basis of an intercomparison of discharge at Delaware river stations. Daily discharge for open-water conditions obtained from a rating curve which is well defined below gage height, 8.0 feet.

Monthly Discharge of Delaware River at Port Jervis, N. Y.
[Drainage area, 3,250 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	39,100	1,000	8,790	2.70	3.11
February	101,000	2,840	17,300	5.32	5.54
March	22,500	3,310	9,230	2.84	3.27
April	28,100	5,820	11,300	3.48	3.88
May	28,800	2,610	11,600	3.57	4.12
June	9,020	1,340	4,140	1.27	1.42
July	2,190	680	1,030	.317	.37
August	1,650	390	725	.223	.26
September	600	330	395	.122	.14
October	525	275	387	.119	.14
November	765	275	417	.128	.14
December	4,090	600	1,260	.388	.45
The year	101,000	275	5,550	1.71	22.84

NEVERSINK RIVER DRAINAGE BASIN.

DESCRIPTION.

The Neversink river is formed by the confluence of the east and west branches of Neversink creek, in the western part of Ulster county. It flows in a southerly direction across the counties of Sullivan and Orange into Delaware river at Port Jervis.

Its principal tributaries are Sheldrake creek, coming in from the west through a chain of lakes and joining the river at Thompsonville, about 25 miles from the mouth, and Bush kill, a small tributary from the same side, joining at Oakland valley, some 12 miles further down-stream. From the east the Basher kill, a tributary of considerable importance, formed by the Pine kill and Garmaeu, flows into the Neversink near Godeffroy, about 9 miles from Port Jervis and just above the gaging station, which is located at the suspension highway bridge at this point.

The river drains a narrow valley along the southern slope of the Catskill mountains. There are several reservoirs in the upper watershed, two of which are now in use. The principal power is located at Rose's Point, near Cuddybackville, in the vicinity of the old Delaware and Hudson canal. About one-half mile above this point is a low concrete dam, which diverts water through the old feeder ditch to the plant. This plant supplies Port Jervis, Middletown and other small places in the vicinity with electric light and power.

NEVERSINK RIVER AT GODEFFROY, N. Y.

This station is located at the suspension highway bridge about one-half mile east of the town of Godeffroy and eight miles above the mouth of the river. A staff gage was established at this point, August 4, 1903, and was washed out October 9, in the same year. A new gage was established August 22, 1909, to obtain general statistical and comparative data regarding the flow of the Neversink, and this is maintained in coöperation with the State Engineer's Department. This is an enameled iron staff gage bolted to the river face, down-stream side of the left-hand abutment.

Bench-mark No. 1 is on the outer corner base stone, right-hand down-stream tower, marked with crow's-foot and circle; elevation, 15.996. Bench-mark No. 2 is a spike in a birch tree 14 inches in diameter, blazed 3 feet above the ground, on left-hand side of west approach to bridge, 10 feet from up-stream tower; elevation, 16.140. Both points are referred to zero of the gage. The datum of the new gage is 0.98 foot lower than the gage of 1903. Therefore all previously published gage heights for this station should have 0.98 feet added, in order to apply to the present datum. The new gage datum has remained the same during the maintenance of the station. Conditions are good for accurate discharge measurements during the open-water period, except for extreme low water, when wading measurements have to be resorted to, or a bridge about one mile farther down-stream used. Area of drainage basin above station is 314.4* square miles; area above mouth, 346* square miles.

Mean Daily Gage Height, in Feet, of Neversink River at Godeffroy, N. Y.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.					
1	......	2.40	2.60	2.75	2.65
2	......	2.52	2.50	2.65	2.45
3	......	2.48	2.60	2.75	2.50
4	......	2.40	2.60	2.75	2.50
5	......	2.42	2.70	2.70	2.35
6	......	2.48	2.55	2.70	2.55
7	......	2.40	2.55	2.75	2.45
8	......	2.45	2.60	2.70	2.60
9	......	2.45	2.60	2.75	2.65
10	......	2.52	2.55	2.75	2.65
11	......	2.50	2.55	2.65	2.65
12	......	2.55	2.60	2.75	2.65
13	......	2.48	2.60	2.65	3.20
14	......	2.60	2.60	2.75	3.94
15	......	2.55	2.55	2.75	3.68
16	......	2.55	2.55	2.75	2.60
17	......	2.50	2.55	2.75	2.55
18	......	2.50	2.50	2.65	2.45
19	......	2.50	2.55	2.80	2.55
20	......	2.55	2.60	2.60	2.40
21	2.85	2.60	2.60	2.50	2.65
22	2.72	2.65	2.55	2.50	2.65
23	2.55	2.65	2.55	2.65	2.55
24	2.78	2.60	2.70	2.65	2.55
25	2.35	2.60	2.65	2.75	2.55
26	2.35	2.55	2.75	2.70	......
27	2.40	2.60	2.60	2.60	......
28	2.42	2.55	2.80	2.70	......
29	2.58	2.55	2.75	2.60	......
30	2.42	2.50	2.60	2.65	......
31	2.50	......	......	......	......

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* Taken from Bein's atlas of New York.

Current-meter Discharge Measurements of Neversink River at Godeffroy, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
1909.		*Feet.*	*Feet.*	*Square feet.*	*Second-feet.*
Aug. 21.....	C. C. Covert......................	2.84	157	495	298
Aug. 22.....	Covert and Hoyt..................	2.70	154	532	202
Nov. 20a....	C. C. Covert......................	2.10	40	32	31

a Measurement made at wading section 800 feet below mouth of Bosher kill.
NOTE.— See also miscellaneous measurements in table next following.

MISCELLANEOUS DISCHARGE MEASUREMENTS MADE IN THE DELAWARE RIVER DRAINAGE BASIN.

DATE.	Stream.	Tributary to.	Locality.	Discharge.
1909.				*Second-feet.*
Aug. 23a....	Neversink river...........	Delaware river..	Godeffroy, N. Y.	169
Nov. 20b....	Neversink river...........	Delaware river..	Godeffroy, N. Y.	76
Nov. 20c....	Neversink river............	Delaware river..	Godeffroy, N. Y.	9.2

a Measurement made in tail-race of power plant.
b Discharge of Neversink river measured at the inflow to the power dam.
c Measurement made above Basher kill; shows leakage when power plant is shut down.

MONGAUP RIVER DRAINAGE BASIN.

DESCRIPTION.

The Mongaup river rises near the village of Bradley in Liberty township, Sullivan county. It flows in a southerly direction through Sullivan county to the Delaware river, into which it empties near the village of Mongaup, about 6 miles northwest of Port Jervis.

The stream has a rather narrow, precipitious, well-timbered drainage basin, which is cut up by numerous small tributaries that form outlets to the various small lakes which characterize this drainage. Among the more important of these tributaries are Middle Mongaup, which joins near Bushville, West Mongaup, which joins near Mongaup valley, and Black Lake creek, about 6 miles farther down-stream. These tributaries are all from the right, while from the left enters Kinne brook, about 3 miles below Mongaup valley, and Black brook, some 8 or 10 miles farther down-stream. The last six or seven miles of the stream's course is along the boundary line between Orange and Sullivan counties.

Throughout its course the stream is very precipitious and it offers several opportunities for power development, the most important of which is Mongaup falls, some 8 or 10 miles above the mouth.

MONGAUP RIVER NEAR RIO, N. Y.

This station is located at the steel highway bridge near Partridge Ranch, about six miles above Mongaup village and about fourteen miles from Port Jervis, N. Y. A standard chain gage was established at this point, December 8, 1906, to obtain general statistical and comparative data regarding the flow of the Mongaup. This station is maintained by Charles H. Cooke, C. E., of New York city, in coöperation with the U. S. Geological Survey and the State Engineer's Department of New York. On account of inability to obtain reliable gage readings, earlier observations at this station have not been published.

The chain has a length of 15.14 feet and is referred to the following bench-marks: No. 1, highest point on a large boulder about fifty feet south of the down-stream side of the right abutment, marked with the letters "B. M."; elevation 6.18. No. 2, a point on the bridge seat on the down-stream, right abutment; elevation 12.07.

The bridge has a span of 140 feet. There is one channel at all stages and measurements are made from the down-stream side of the bridge. The channel above the station is straight for about 500 feet and during low and medium stages is divided into two parts by a small island just above the bridge. The channel below the bridge is straight for about 200 feet, when it makes an abrupt turn to the right. The banks on either side are of medium height and rarely overflow, except during extreme high stages. Conditions for measuring at this point are fairly good, except in low stages, when the current becomes rather sluggish. Low-water measurements are usually made by wading at the ripples below the bridge. Very few measurements have been made and there is no rating curve for this station.

Mean Daily Gage Height, in Feet, of Mongaup River at Rio, N. Y.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.					
1	......	0.72	0.74	0.68	0.80
2	......	0.74	0.68	0.69	0.78
3	......	0.72	0.69	0.64	0.85
4	......	0.69	0.64	0.69	0.78
5	......	0.72	0.68	0.72	0.78
6	......	0.69	0.65	0.74	0.72
7	......	0.66	0.62	0.70	0.62
8	0.66	0.66	0.59	0.68	0.74
9	0.69	0.66	0.62	0.68	0.65
10	0.70	0.78	0.70	0.69	0.78
11	0.74	0.86	0.74	0.70	0.75
12	0.66	0.82	0.79	0.70	0.88
13	0.69	0.78	0.82	0.69	0.90
14	0.69	0.72	0.80	0.68	1.80
15	0.80	0.72	0.69	0.70	1.60
16	0.92	0.69	0.66	0.70	1.30
17	1.09	0.76	0.75	0.65	1.15
18	1.56	0.75	0.69	0.65	1.25
19	1.14	0.66	0.68	0.64	1.25
20	1.02	0.69	0.68	0.66	1.25
21	0.95	0.69	0.68	0.64	1.40
22	0.89	0.69	0.69	0.64	1.42
23	0.84	0.62	0.72	0.66	....
24	0.76	0.72	0.78	0.68	....
25	0.79	0.80	0.78	0.70	....
26	0.75	0.68	0.80	0.78	....
27	0.74	0.66	0.80	0.88	....
28	0.74	0.72	0.79	0.91	....
29	0.74	0.75	0.78	0.78	....
30	0.75	0.76	0.76	0.78	....
31	0.74	......	0.74	......	....

Current-meter Discharge Measurements of Mongaup River near Rio, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
1909.		*Feet.*	*Feet.*	*Square feet.*	*Second-feet.*
July 24	C. C. Covert and W. A. James	1.12	138	157	150
Nov. 19a	C. C. Covert	.74	72	60	51

a Measurement made at wading section.

SUSQUEHANNA RIVER DRAINAGE BASIN.

DESCRIPTION OF SUSQUEHANNA RIVER.

Susquehanna river rises in Otsego lake, in northern Otsego county, N. Y., at an elevation of 1,193 feet above tide and flows in a general southerly direction into Chesapeake bay. Its course is in many places extremely tortuous, crossing the state boundary between New York and Pennsylvania three times. The entire length of the river is about 500 miles, and it drains an area of 27,400 square miles, of which 21,060 square miles lie in Pennsylvania, 6,080 in New York, and 260 in Maryland.

The topography of the basin varies widely in character. In New York the stream and its tributaries flow through a rolling and in places rather broken country, bounded on the north by a mountainous area. In this part of the course its bed is of gravel or sand, with occasional rock ledges, and its banks are moderately high and not extensively subject to overflow. In Pennsylvania the river enters a mountain region, its banks are high, and it winds and twists among the parallel ranges in a bed composed generally of drift materials, gravel, sand and boulders. In the lower part of its course, from Marietta to Havre de Grace, it occupies a broad, deep valley, varying in width from a few hundred feet to more than a mile, and is for the most part bounded on either shore by rocky bluffs and table-lands elevated from 100 to 500 feet above its waters.

SUSQUEHANNA RIVER AT BINGHAMTON, N. Y.

This station was established July 31, 1901, by Robert E. Horton, and has since been maintained by the U. S. Geological Survey in coöperation with this Department. It is located at the Washington street bridge, about 800 feet up-stream from the junction of Chenango and Susquehanna rivers.

On account of the unfavorable conditions produced by a rift, which extends diagonally across the stream underneath the Washington street bridge, discharge measurements are made at the Exchange street bridge, 1,900 feet up-stream.

A standard chain gage is attached to the up-stream side of the left span of the Washington street bridge. The gage is up-stream from the crest of the rift and over a stretch of smooth water extending to the dam, 2,800 feet above. Gage readings are unaffected by backwater from Chenango river at ordinary stages. The gage is read twice each day by William Ray Monroe. The bench-mark is a chisel draft on the corner of the left bridge abutment on the up-stream side. Its assumed elevation is 100.00. The elevation of water-surface, when the gage reads zero, is 76.29.

Current-meter Discharge Measurements of Susquehanna River at Binghamton, N. Y

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
1909.		*Feet.*	*Feet.*	*Square feet.*	*Second-feet.*
Aug. 20.....	C. C. Covert......................	2.43	438	497	1,540

Mean Daily Discharge, Second-feet, of Susquehanna River at Binghamton, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	810	2,450	8,880	8,430	16,800	2,090	1,380	700	500	335	600	700
2	810	3,440	7,320	8,580	20,600	1,730	1,150	810	500	418	700	920
3	920	3,070	6,920	10,100	14,600	1,610	1,150	920	500	335	700	1,040
4	1,380	3,070	6,780	10,400	16,100	1,610	1,150	810	500	418	600	920
5	4,700	2,940	5,470	9,960	14,600	1,850	1,150	810	500	500	700	920
6	19,400	7,400	4,070	9,180	11,600	3,440	920	810	418	335	700	920
7	14,800	13,300	4,700	11,100	12,800	3,120	700	700	600	335	418	920
8	7,860	10,400	4,370	13,200	10,800	2,450	920	500	467	335	700	920
9	4,520	6,380	4,120	11,700	9,180	2,090	1,040	700	418	335	700	800
10	4,070	4,950	8,280	9,030	7,190	1,970	1,040	700	500	335	810	700
11	4,070	7,320	16,800	7,860	10,900	5,470	920	700	600	500	600	700
12	3,570	6,380	14,000	6,520	11,500	3,700	700	500	418	418	500	700
13	2,570	5,600	8,880	5,730	8,280	3,070	700	418	600	700	500	800
14	2,090	5,390	8,000	11,400	6,780	4,820	600	600	700	418	418	1,260
15	2,450	8,280	6,650	24,000	7,460	4,570	700	418	500	418	418	1,380
16	3,200	12,000	5,470	20,800	6,650	3,570	700	500	500	335	600	1,850
17	3,070	16,400	4,820	15,600	5,910	2,570	700	600	500	335	500	1,380
18	2,090	12,000	4,200	12,700	6,380	4,320	1,040	920	600	335	700	1,100
19	1,850	7,730	4,070	9,960	5,340	3,820	920	1,850	418	500	600	1000
20	2,090	32,100	3,570	9,180	4,570	3,320	920	1,610	418	335	600	920
21	2,040	33,600	3,570	8,430	4,070	2,570	700	1,500	600	335	335	800
22	2,330	25,100	2,940	8,000	3,570	2,330	700	1,150	418	418	500	800
23	2,450	14,800	2,940	7,460	3,320	2,090	700	1,040	335	500	600	700
24	4,440	19,700	2,700	6,380	3,070	1,850	700	1,040	500	500	700	700
25	27,300	29,100	4,950	5,600	2,700	1,970	920	920	418	700	700	600
26	22,800	24,700	17,600	4,820	2,450	1,850	1,150	920	335	700	600	600
27	13,600	14,900	14,100	4,950	2,330	2,330	1,150	810	335	920	700	600
28	8,280	12,500	12,700	4,570	2,280	1,970	1,150	700	500	920	600	600
29	5,730	......	12,400	4,320	2,330	1,500	1,150	700	335	700	700	500
30	5,340	......	11,200	10,100	2,330	1,380	1,040	920	335	700	700	500
31	4,320	......	9,490	......	2,090	......	920	700	......	500	......	500

NOTE.— Daily discharges January 1 to February 6 slightly affected at times by anchor ice. Open channel rating applied throughout. Discharges December 9–31 affected by ice conditions. These have been corrected and verified by intercomparisons with other stations in the Susquehanna drainage. Daily discharges January 1 to December 8 have been obtained from a well defined rating curve below 6 feet. The upper part of the curve is based on one measurement at 16.3 feet.

Monthly Discharge of Susquehanna River at Binghamton, N. Y.
[Drainage area, 2,400 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	27,300	810	5,970	2.49	2.87
February	33,600	2,450	12,300	5.12	5.33
March	17,600	2,700	7,480	3.12	3.60
April	24,000	4,320	9,670	4.03	4.50
May	20,600	2,090	7,700	3.21	3.70
June	5,470	1,380	2,700	1.12	1.25
July	1,380	600	928	.387	.45
August	1,850	418	838	.349	.40
September	700	335	476	.198	.22
October	920	335	480	.200	.23
November	810	335	607	.253	.28
December	1,850	500	863	.360	.42
The year	33,600	335	4,170	1.74	23.25

MISCELLANEOUS DISCHARGE MEASUREMENTS, SUSQUEHANNA RIVER DRAINAGE BASIN.

A measurement of the discharge of Susquehanna river at Sidney, N. Y., was made by C. C. Covert, July 21, 1909. Stage of the stream was 26.72 feet below the top of the hand-rail, 30 feet from the left-hand end of the bridge on the down-stream side. Discharge was 296 second-feet.

A measurement of the same stream at Owego, N. Y., April 24, 1909, showed a discharge of 9,780 second-feet, the stage of the stream being 2.80, as indicated by a gage on the down-stream end of the right-hand pier of the bridge.

CHENANGO RIVER AT BINGHAMTON, N. Y.

Chenango river rises in central Madison county, N. Y., in the towns of Eaton and Madison, flows southward, and unites with the Susquehanna at Binghamton. Its head-water valleys lie at an elevation of about 1,200 feet above tide. The elevation of its mouth above tide is 864 feet. Its length is, approximately, 70 miles and its drainage area is 1,580 square miles.

The gaging station, which was established July 31, 1901, by Robert E. Horton, has since been maintained by the U. S. Geological Survey in coöperation with this Department. It is located at the Court street bridge, Binghamton.

The bridge to which the gage is attached stands squarely across the stream at a point where there is a good bed of gravel and small cobblestones and a smooth, uniform current. The channel is obstructed by three masonry piers supporting the four spans of the bridge, 79 feet clear width each, the bridge having a total length of 337 feet between abutments. A small rift between the station and the confluence of Chenango river with the Susquehanna, about 2,500 feet below, cuts off backwater at ordinary stages of the rivers. For periods during freshets or at times when there is an abnormal rise on one or both streams, either record may be affected by backwater and too great a discharge indicated.

A standard chain gage is attached to the hand-rail of the bridge on the up-stream side of the first span from the right bank. The gage is read by William Ray Monroe. The bench-mark is a circular chisel draft on the up-stream corner of the bridge-seat on the left abutment. Its assumed elevation is 100.00. The elevation of water-surface, when the gage reads zero, is 65.98.

In estimating the run-off of Chenango river, the area directly tributary to storage reservoirs, from which diversion is made to supply Erie canal, has been deducted from the total natural drainage area. The diversion area of six reservoirs at the head of Chenango river, whose outflow is turned into Erie canal through Oriskany creek, is about 30 square miles. The diversion area of De Ruyter reservoir, at the head of Tioughnioga river, whose outflow is turned into Erie canal through Limestone creek, is 18.2 square miles. These two areas have been subtracted from the natural drainage area of 1,580 square miles, giving an effective area of 1,532 square miles. This estimate is approximate, as no allowance for direct inflow to feeder channels from additional areas, nor for waste into the original stream, has been made. The gross area, from which more or less run-off is diverted, is about 105 square miles.

Mean Daily Gage Height, in Feet, of Chenango River at Binghamton, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	5.20	6.10	8.25	8.55	10.90	5.95	5.40	5.10	4.90	4.80	5.15	5.40
2	5.10	5.95	7.80	8.70	12.30	5.80	5.35	5.15	4.90	4.95	5.00	5.30
3	5.20	6.20	7.65	9.20	10.20	5.80	5.30	5.15	4.90	5.00	5.10	5.20
4	5.30	6.15	7.75	9.20	10.60	5.80	5.15	5.10	4.90	4.95	5.10	5.20
5	6.40	6.20	7.00	8.90	9.95	6.00	5.20	5.00	4.90	4.90	5.10	5.40
6	11.30	8.20	6.90	8.90	8.90	7.40	5.15	5.00	4.90	4.90	5.00	5.20
7	9.80	10.10	7.05	9.80	9.50	6.52	5.20	5.10	4.90	4.90	4.80	5.20
8	7.35	9.00	6.80	10.30	8.75	6.20	5.15	4.85	4.90	4.90	5.10	5.20
9	6.65	7.55	6.70	9.50	8.28	6.00	5.10	5.05	4.90	4.85	4.95	4.95
10	6.65	7.10	8.60	8.60	7.70	6.30	5.10	5.05	5.00	4.85	5.05	5.15
11	6.55	8.15	11.00	8.20	9.20	7.30	5.10	5.10	5.20	4.90	5.00	5.15
12	6.50	7.48	9.90	7.70	9.15	6.60	5.10	4.90	5.20	5.00	5.00	5.00
13	5.80	7.28	8.45	7.40	8.00	6.30	5.00	4.90	5.20	5.00	5.05	5.20
14	5.75	7.20	8.20	9.60	7.60	7.48	5.00	4.80	5.10	5.10	5.00	5.20
15	6.15	8.35	7.70	13.15	7.85	6.90	5.00	4.80	5.10	5.00	5.00	6.25
16	6.00	9.40	7.20	11.90	7.52	6.40	4.90	4.85	5.10	5.00	3.00	6.15
17	5.70	10.60	7.15	10.20	7.30	6.20	4.90	5.00	5.00	4.95	5.00	5.65
18	5.65	9.20	6.80	9.30	7.25	6.75	5.20	5.00	4.95	4.95	5.00	5.60
19	5.50	7.90	6.75	8.50	6.95	6.70	5.20	5.20	4.90	4.95	5.05	5.40
20	5.60	15.40	6.70	8.30	6.75	6.35	5.00	5.15	4.85	4.95	5.05	5.35
21	5.75	15.70	6.60	8.00	6.50	6.10	5.00	5.15	4.90	4.95	5.00	5. 0
22	5.80	13.05	6.40	7.95	6.35	5.98	5.00	5.00	4.90	4.95	5.10	5.45
23	5.90	10.25	6.30	7.60	6.30	6.02	5.00	5.20	4.80	5.10	5.20	5.40
24	6.65	11.90	6.35	7.20	6.20	6.00	5.10	5.00	5.00	5.20	5.40	5.35
25	13.80	14.65	8.15	6.95	6.10	5.70	5.45	5.10	5.00	5.40	5.20	5.35
26	12.60	13.05	11.65	6.80	6.00	5.70	5.40	4.70	4.90	5.20	5.20	5.30
27	9.70	10.30	10.35	6.70	5.95	5.60	5.25	4.95	4.95	5.20	5.25	5.30
28	8.10	9.50	9.90	6.60	5.95	5.60	5.15	4.60	5.00	5.15	5.30	5.25
29	7.20	......	9.70	6.55	6.10	5.55	5.20	4.95	5.00	5.10	5.20	5.35
30	7.10	......	9.25	8.40	6.00	5.50	5.20	5.05	4.80	5.10	5.40	5.25
31	6.85	......	8.70	......	6.00	......	5.15	4.90	......	4.95	......	5.20

NOTE.— Ice conditions prevailed from about January 21 to 31, and also for short intervals during the winter season.

Mean Daily Discharge, Second-feet, of Chenango River at Binghamton, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	305	1,210	4,440	4,950	9,160	1,020	460	235	115	70	270	460
2	235	1,020	3,700	5,220	11,800	850	420	270	115	142	170	380
3	305	1,340	3,460	6,090	7,860	850	380	270	115	170	235	305
4	380	1,280	3,620	6,090	8,590	850	270	235	115	142	235	305
5	1,620	1,340	2,470	5,560	7,410	1,080	305	170	115	115	235	460
6	9,920	4,360	2,320	5,560	5,560	3,060	270	170	115	115	170	305
7	7,140	7,680	2,540	7,140	6,620	1,780	305	235	115	115	70	305
8	2,990	5,740	2,180	8,040	5,300	1,340	270	92	115	115	235	305
9	1,960	3,300	2,040	6,620	4,490	1,080	235	202	115	92	142	142
10	1,960	2,620	5,040	5,040	3,540	1,480	235	202	170	92	202	270
11	1,820	4,270	9,350	4,360	6,090	2,920	235	235	305	115	170	270
12	1,760	3,190	7,320	3,540	6,000	1,900	235	115	305	170	170	170
13	850	2,880	4,780	3,060	4,020	1,480	170	115	305	170	202	305
14	798	2,760	4,360	6,790	2,380	3,190	170	70	235	235	170	305
15	1,280	4,610	3,540	13,600	3,780	2,320	170	70	235	170	170	1,550
16	1,080	6,440	2,760	11,100	3,250	1,620	115	92	235	170	170	1,280
17	745	8,590	2,690	7,860	2,920	1,340	115	170	170	142	170	695
18	695	6,090	2,180	6,260	2,840	2,110	305	170	142	142	170	645
19	550	3,860	2,110	4,860	2,400	2,040	305	305	115	142	202	460
20	645	18,200	2,040	4,520	2,110	1,550	170	170	92	142	202	420
21	798	18,900	1,900	4,020	1,760	1,210	170	270	115	142	170	380
22	850	13,400	1,620	3,940	1,550	1,060	170	170	115	142	235	350
23	960	7,950	1,480	3,380	1,480	1,110	170	305	70	235	305	300
24	1,960	11,100	1,550	2,760	1,340	1,080	235	170	170	305	460	300
25	14,900	16,700	4,270	2,400	1,210	745	505	235	170	460	305	300
26	12,400	13,400	10,600	2,180	1,080	745	460	35	115	305	305	250
27	6,960	8,040	8,130	2,040	1,020	645	342	142	142	305	342	250
28	4,190	6,620	7,320	1,900	1,020	645	270	10	170	270	380	250
29	2,760	......	6,960	1,820	1,210	598	305	142	170	235	305	250
30	2,620	......	6,180	4,700	1,080	550	305	202	70	235	460	250
31	2,250	......	5,220	......	1,080	......	270	115..	....	142..	....	250

NOTE.— Daily discharge January 1 to December 20 is based on a well defined rating curve. Daily discharge January 1 to February 6 and December 1–20 may be somewhat nexcess, due to slight ice conditions for short intervals. Daily discharge December 21 to 30 is estimated on the basis of daily discharge at other stations in the Susquehanna drainage .

Monthly Discharge of Chenango River at Binghamton, N. Y.
[Drainage area, 1,530 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	14,900	235	2,830	1.85	2.13
February	18,900	1,020	6,670	4.36	4.54
March	10,600	1,480	4,130	2.70	3.11
April	13,600	1,820	5,180	3.39	3.78
May	11,800	1,020	3,900	2.55	2.94
June	3,190	550	1,410	.922	1.03
July	505	115	269	.176	.20
August	305	10	177	.116	.13
September	305	70	155	.101	.11
October	460	70	179	.117	.13
November	460	70	234	.153	.17
December	1,550	142	402	.263	.30
The year	18,900	10	2,130	1.39	18.57

CHEMUNG RIVER.

DESCRIPTION.

Chemung river is formed at Painted Post, N. Y., by the confluence of Tioga and Cohocton rivers. Cohocton river lies entirely in the state of New York. Tioga river receives, just above its mouth, Canisteo river, a large tributary, which also has its drainage basin in New York to the south of Cohocton. The drainage area of Tioga river, above the Canisteo, is mainly in Pennsylvania. Chemung river flows southeastward through Corning, Elmira and Chemung, crosses the state line and flows for a short distance in Pennsylvania, then returns to New York, and crosses again to Pennsylvania near Waverly, finally emptying into the Susquehanna near Athens, Bradford county, Pa. The total length of the river is about 40 miles, of which 30 miles lie in New York; the drainage area, measured at the mouth, is 2,520 square miles.

The topographic features of the basin are, as a rule, bold and broad. The hills rise to a height of several hundred feet on either side, within a short distance of the stream. The upland plateau is to a large extent wooded, has impervious soil, no lake storage, and few marsh areas. Tributaries are ramifying and uniformly distributed, though not very numerous, and dry gullies, or flood channels, are common. The main river is sluggish, with low banks and a broad valley or flood plain, which is often overflowed. The concentration of storm waters from the three large streams, which unite just above Corning, makes possible excessive floods. Dikes have been erected in the cities of Elmira and Corning for protection. One of the highest recorded freshets in the stream occurred June 1, 1889. It was preceded by phenomenal rainfall, aggregating several inches in a few hours during the night of May 31. The discharge at this time has been estimated at 67 second-feet per square mile from 2,055 square miles, or 138,000 second-feet.[a]

CHEMUNG RIVER AT CHEMUNG, N. Y.

The gaging station was established September 7, 1903, by Robert E. Horton. It has since been maintained by the U. S. Geological Survey in coöperation with this Department. It is located at the suspension highway bridge, midway between Chemung, N. Y., and Willawana, Pa., near the state line.

The channel is straight for 700 feet above and 800 feet below the station. The right bank is high, cleared, and not subject to overflow; the left bank is medium height, wooded, and will overflow at high water. The bed of the stream is composed of gravel and is clean and permanent. The current is good. There is but one channel at all stages.

Discharge measurements are made from the down-stream side of the bridge, which has a single span of 395 feet. The initial point for soundings is the face of the right abutment on the down-stream side.

A standard chain gage is attached to the up-stream side of the bridge, near the right bank, and is read twice each day by Daniel L. Orcutt. The bench-mark is formed by three nails driven into a telephone pole 70 feet to the right of the initial point for soundings and about 30 feet up-stream. The pole is marked with black paint "U. S. G. S. B. M." Elevation of bench-mark is assumed at 100.000. The elevation of water-surface, when the gage reads zero, is 70.12.

The smooth water reaches of the stream became ice-covered in winter. Needle ice forms over the rapids and is carried under the surface ice. Much of the winter flow apparently filters through these beds of needle ice at times. The conditions render the estimation of the daily discharge in winter impracticable.

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[a] Report of Francis Collingwood, C. E., on the protection of the city of Elmira, N. Y. against floods.

Mean Daily Gage Height, in Feet, of Chemung River at Chemung, N. Y.

DAY.	Jan.	Feb.	Mar	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	......	......	4.72	5.33	15.39	2.95	2.66	1.80	1.70	1.80	1.91	1.88
2	......	......	4.44	5.37	15.15	2.79	2.43	1.80	1.67	1.72	1.94	1.93
3	......	......	4.64	5.47	9.61	2.72	2.40	1.80	1.70	1.72	1.85	1.93
4	......	......	4.56	5.19	7.73	2.64	2.30	1.80	1.76	1.69	1.85	1.79
5	......	......	4.06	4.93	6.67	3.29	2.28	1.78	1.74	1.68	1.95	1.90
6	4.93	......	3.64	5.03	5.91	6.85	2.27	1.78	1.60	1.74	1.80	1.79
7	5.20	7.16	4.14	6.15	5.81	4.97	2.26	1.76	1.71	1.72	1.66	1.80
8	3.38	5.16	4.26	5.85	5.27	4.10	2.20	1.77	1.69	1.70	1.82	1.80
9	3.07	4.38	4.18	5.08	4.82	3.66	2.15	1.72	1.72	1.74	1.96	1.87
10	3.20	4.11	5.92	4.79	4.99	3.70	2.12	1.71	1.74	1.76	1.93	......
11	3.42	4.32	7.48	4.45	4.77	7.12	2.09	1.66	1.90	1.74	1.90	1.85
12	2.96	3.60	5.54	4.25	4.37	5.29	2.08	1.66	1.80	1.80	1.86	......
13	2.86	3.68	5.08	4.19	4.18	4.40	2.10	1.86	1.74	1.74	1.84	......
14	......	3.52	4.84	8.02	4.23	6.04	1.96	1.65	1.96	1.76	1.88	......
15	......	3.84	4.56	10.73	4.23	5.52	1.96	1.72	1.76	1.95	1.76	......
16	......	4.46	4.21	7.50	4.29	4.50	1.98	1.66	1.84	1.84	1.85	......
17	......	3.80	3.93	6.31	4.05	3.98	1.94	1.82	1.89	1.88	1.73	......
18	......	3.76	3.64	5.48	3.83	4.57	1.88	1.84	1.80	1.78	1.70	......
19	......	3.65	3.56	5.01	3.68	4.33	1.90	1.78	1.86	1.85	1.70	......
20	......	7.37	3.57	4.66	3.57	3.75	1.90	1.92	1.64	1.76	1.78	......
21	......	7.70	3.45	4.61	3.43	3.44	1.88	1.86	1.82	1.78	1.78	2.82
22	......	6.44	3.27	4.65	3.32	3.26	1.89	1.82	1.80	1.88	1.74	......
23	......	7.33	3.17	4.59	3.23	3.38	2.01	1.71	1.78	1.92	1.86	......
24	6.96	10.06	3.04	4.15	3.14	3.43	2.03	1.85	1.74	1.84	1.72	......
25	9.31	11.01	3.21	3.92	3.11	3.36	2.00	1.80	1.81	1.94	1.72	......
26	6.70	6.93	3.27	3.67	3.03	3.00	2.02	1.82	1.76	2.08	2.01	......
27	5.18	6.06	4.73	3.57	2.99	2.84	2.04	1.82	1.70	2.10	1.92	......
28	4.48	5.41	4.87	3.53	3.03	2.81	1.93	1.80	1.86	2.05	1.89	......
29	3.88	......	5.27	3.87	3.43	2.66	1.94	1.83	1.78	2.02	1.94	......
30	3.48	......	5.17	8.75	3.31	2.78	1.87	1.66	1.88	1.99	1.88	......
31	......	......	5.05	......	3.08	......	1.80	1.76	......	2.00	......	......

NOTE.— Ice conditions prevailed from about January 1 5, 14 23, January 31 to February 6 and December 9 31.

Current-meter Discharge Measurements of Chemung River at Chemung, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
1909.		*Feet.*	*Feet.*	*Square feet.*	*Second-feet.*
April 23	C. C. Covert	4.62	305	1,600	3,290
Aug. 19	C. C. Covert	1.82	205	234	156
Dec. 21*a*	C. C. Covert	2.82	220	1,110	232

a Complete ice cover; average thickness of ice, 0.40 foot; gage height to top of ice, 2.88 feet.

Mean Daily Discharge, Second-feet, of Chemung River at Chemung, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	300	1,000	3,530	4,870	46,200	898	655	140	105	140	184	172
2	300	900	2,990	4,970	45,000	757	491	140	96	112	198	194
3	300	1,000	3,370	5,210	18,100	701	470	140	105	112	160	194
4	300	1,000	3,210	4,550	11,400	640	405	140	126	102	160	136
5	1,500	1,000	2,330	3,970	8,320	1,250	392	133	119	99	160	180
6	3,970	2,000	1,700	4,190	6,320	8,800	386	133	75	119	140	136
7	4,570	9,670	2,460	6,940	6,060	4,050	379	126	108	112	93	140
8	1,360	4,480	2,660	6,160	4,730	2,390	340	130	102	105	148	140
9	1,020	2,870	2,530	4,300	3,730	1,720	310	112	112	119	207	150
10	1,150	2,410	6,340	3,670	4,100	1,780	292	108	119	126	194	150
11	1,410	2,770	10,600	3,000	3,630	9,560	274	93	180	119	180	150
12	907	1,640	5,380	2,640	2,860	4,780	269	93	140	140	164	150
13	816	1,750	4,300	2,540	2,530	2,910	280	99	119	119	156	160
14	700	1,540	3,770	12,400	2,610	6,650	207	90	207	126	172	180
15	600	1,980	3,210	22,800	2,610	5,330	207	112	126	202	126	200
16	600	3,020	2,580	10,700	2,710	3,100	216	93	156	156	160	210
17	600	1,920	2,120	7,360	2,310	2,200	198	148	176	172	116	220
18	500	1,870	1,700	5,230	1,970	3,230	172	156	140	133	105	230
19	500	1,710	1,590	4,140	1,750	2,780	180	133	164	160	105	230
20	500	10,300	1,600	3,470	1,600	1,850	180	189	87	126	133	230
21	500	11,300	1,450	3,310	1,420	1,440	172	156	148	133	133	230
22	500	7,700	1,230	3,390	1,290	1,220	176	148	140	172	119	230
23	1,000	10,200	1,120	3,270	1,180	1,360	230	108	133	189	164	230
24	9,110	19,900	985	2,480	1,090	1,420	242	160	119	156	112	230
25	18,000	24,000	1,100	2,110	1,060	1,340	225	140	144	198	112	230
26	8,400	9,020	1,230	1,740	975	945	236	148	126	269	230	230
27	4,440	6,710	3,550	1,600	936	799	247	148	105	280	189	230
28	3,060	5,000	3,840	1,550	975	774	194	140	164	252	176	230
29	2,040	......	4,730	2,030	1,420	655	198	152	133	236	198	230
30	1,480	......	4,500	14,900	1,280	749	168	93	172	220	172	230
31	1,200		4,230		1,020		140	126	......	225	......	230

NOTE.— Daily discharges for open water period were obtained from a well defined rating curve. Daily discharges for ice period estimated on the basis of discharge at other stations in the Susquehanna drainage.

Monthly Discharge of Chemung River at Chemung, N. Y.

[Drainage area, 2,440 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	17,000	300	2,278	0.934	1.07
February	24,000	900	5,310	2.18	2.27
March	10,600	985	3,100	1.27	1.46
April	22,800	1,550	5,320	2.18	2.43
May	46,200	936	6,170	2.53	2.92
June	9,560	640	2,540	1.04	1.16
July	655	140	275	.113	.13
August	189	90	130	.053	.06
September	207	75	132	.054	.06
October	280	99	159	.065	.07
November	230	93	156	.064	.07
December	230	136	196	.080	.09
The year	46,200	75	2,150	.881	11.81

ALLEGHENY RIVER DRAINAGE BASIN.

DESCRIPTION OF ALLEGHENY RIVER.

Allegheny river, which, with the Monongahela, forms the Ohio at Pittsburg, rises in northern Pennsylvania, flows north into the state of New York, then flows south through western Pennsylvania. The headwaters have an elevation of about 2,500 feet and join those of Genesee river on the north and of the Susquehanna on the east. The total length from the source to the mouth at Pittsburg is about 300 miles, 47 of which are in the state of New York. The principal facts concerning this river have been given in a report by George Lehman, assistant engineer, contained in House Document No. 72, Fifty-fifth Congress, third session. Although this river drains a large area, much of which is of an elevated and even mountainous character, yet it is of comparatively small value for water-power. The total fall in 255 miles, between Olean, N. Y., and the mouth, is only 725 feet, or an average of less than 3 feet per mile. This descent is accomplished without abrupt pitches, and even with few rapids having a fall of much consequence. The drainage basin of Allegheny river above Red House is comparatively rugged and precipitous. It is mostly covered with brush and light forest. A considerable amount of snow accumulates in the winter and feeds the stream until late in spring. The basin is underlain by shales of the Chemung series, and the depth of soil is usually small, excepting in stream valleys. There are no lakes and no artificial storage tributary to the stream. The Cuba reservoir, which feeds the Erie canal through Genesee river, lies on the divide between the Allegheny and Genesee drainage basins. Apart of the overflow from this reservoir passes into the Allegheny, the rest passes into Genesee river. During about half of the year the river is navigable for small steamers to Franklin, 123 miles above Pittsburg.

ALLEGHENY RIVER AT RED HOUSE, N. Y.

This station was established September 4, 1903, by Robert E. Horton. It has since been maintained by the U. S. Geological Survey in coöperation with this Department. It is located at the Red House bridge, near the stations of the Erie and Pennsylvania railroads and about 5 miles below Salamanca, N. Y., about 13 miles above the point where the river leaves New York state. At Olean, N. Y., the wasteway from the Cuba reservoir enters the stream through Olean creek. This reservoir is located on the divide between Oil creek, tributary to Allegheny river, and Genesee river. The storage is commonly turned into Genesee river through the abandoned summit level of Genesee Valley canal, but may be diverted into Oil creek through the guard-lock at the head of the canal.

The channel is straight for 800 feet above and below the station, 494 feet wide between abutments, broken by two piers. The current velocity is well distributed. The right bank is high and does not overflow. The left bank overflows only at flood stages. At extreme high water there is an additional flood channel on the left bank. The bed is of gravel and is regular.

Discharge measurements are made from the down-stream side of the bridge. The initial point for soundings is the left end of the down-stream side of the bridge.

A standard chain gage is fastened to the up-stream side of the bridge near the middle of the left span; length of chain, 24.16 feet. The gage is read twice each day by G. H. Smith. The bench-mark is a circle cut on the down-stream side of the left abutment; assumed elevation, 100.00. The elevation of water-surface, when the gage reads zero, is 78.91.

Mean Daily Gage Height, in Feet, of Allegheny River at Red House, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	3.53	4.33	7.33	5.33	11.93	4.13	3.93	2.93	2.83	2.83	3.23	3.33
2	3.43	4.23	7.43	5.13	12.53	3.93	3.83	2.93	2.83	2.83	3.23	3.33
3	3.33	4.13	6.93	4.93	11.38	3.83	3.73	2.93	2.83	2.73	3.13	3.23
4	3.43	5.43	6.23	5.73	9.88	3.83	3.73	2.83	2.83	2.73	3.13	3.23
5	5.93	6.13	5.43	5.53	8.83	3.93	3.63	2.83	2.83	2.73	3.13	3.23
6	8.23	8.03	4.83	5.43	7.63	5.53	3.63	2.83	2.83	2.73	3.13	3.23
7	7.93	7.53	4.73	5.73	6.53	5.83	3.53	2.83	2.73	2.73	3.03	3.23
8	5.93	6.73	4.73	5.93	6.03	5.43	3.43	2.83	2.73	2.73	3.13	3.33
9	4.94	5.93	4.63	5.83	5.63	5.23	3.33	2.83	2.73	2.73	3.23	3.33
10	4.73	5.63	4.93	6.13	5.23	5.33	3.33	2.83	2.73	2.73	3.23	3.23
11	4.63	5.63	6.43	5.53	5.23	5.73	3.23	2.83	2.73	2.93	3.43	3.43
12	4.53	5.13	6.33	5.33	5.63	5.33	3.13	2.83	2.73	2.73	3.33	3.43
13	4.43	4.93	5.93	5.33	5.43	5.03	3.03	2.83	2.73	2.53	3.23	3.53
14	4.53	4.93	5.63	6.13	5.33	5.13	3.03	2.83	2.73	3.13	3.23	3.73
15	4.33	5.43	5.23	6.73	5.23	4.93	2.93	2.83	2.73	2.93	3.23	3.73
16	4.23	8.13	4.93	6.03	5.93	4.73	2.93	2.83	2.73	2.93	3.23	3.73
17	4.23	7.53	4.73	5.53	6.13	4.63	2.83	2.93	2.73	3.03	3.33	......
18	4.03	6.83	4.63	5.43	6.03	4.63	2.83	2.93	2.73	2.93	3.33	3.80
19	4.03	7.13	4.53	5.33	5.73	4.53	2.83	2.93	2.73	3.03	3.33	......
20	3.93	4.33	4.53	6.03	5.43	4.53	2.93	2.83	2.73	3.23	3.43	......
21	3.83	6.73	4.43	6.43	5.23	4.73	2.93	2.83	2.73	3.43	3.53	......
22	3.93	6.33	4.33	6.13	4.93	5.13	3.03	2.83	2.73	3.83	3.93	......
23	5.73	6.73	4.33	5.83	4.83	5.13	3.13	2.83	2.73	3.73	4.53	3.80
24	7.43	8.78	4.93	5.63	4.53	5.03	3.23	2.83	2.73	3.63	4.43	......
25	8.13	9.63	7.83	5.33	4.33	5.03	3.13	2.83	2.73	3.63	4.43	......
26	7.23	8.93	7.93	5.43	4.23	4.93	3.13	2.83	2.73	3.83	3.93	......
27	6.73	8.33	6.93	5.43	4.03	4.73	3.13	2.83	2.73	3.53	3.93	......
28	5.93	7.83	6.33	5.43	3.93	4.63	3.03	2.83	2.73	3.43	3.83	......
29	5.43	......	5.73	5.33	4.23	4.33	3.03	2.83	2.73	3.33	3.53	......
30	4.93	......	5.63	10.73	4.23	4.13	3.03	2.83	2.83	3.33	3.43	......
31	4.53	......	5.43	......	4.13	......	2.93	2.83	......	3.33	......	3.80

NOTE.— No ice notes obtained for January, February and March. Probably the river at the gage was not affected much by ice conditions during this period. Ice conditions from about December 16 to 31.

Current-meter Discharge Measurements of Allegheny River at Red House, N. Y.

DATE.	Hydrographer.	Gage height.	Width.	Area of section.	Discharge.
		Feet.	*Feet.*	*Square feet.*	*Second-feet.*
1909. Aug. 18a	C. C. Covert	2.91	80	103	271

a Measurement made at wading section, one-half mile up-stream.

Mean Daily Discharge, Second-feet, of Allegheny River at Red House, N. Y.

DAY.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	900	1,940	9,840	3,890	31,300	1,650	1,380	320	242	242	588	685
2	788	1,790	10,200	3,420	34,600	1,380	1,250	320	242	242	588	685
3	685	1,650	8,510	2,980	28,300	1,250	1,130	320	242	168	497	588
4	788	4,140	6,340	4,910	20,500	1,250	1,130	242	242	168	497	588
5	5,460	6,040	4,140	4,390	15,800	1,380	1,010	242	242	168	497	588
6	13,200	12,400	2,780	4,140	10,900	4,390	1,010	242	242	168	497	588
7	12,000	10,500	2,600	4,910	7,240	5,180	900	242	168	168	407	388
8	5,460	7,870	2,600	5,460	5,750	4,140	788	242	168	168	497	685
9	3,000	5,460	2,420	4,180	4,650	3,650	685	242	168	168	588	685
10	2,600	4,650	2,980	6,040	3,650	3,890	685	242	168	168	588	588
11	2,420	4,650	6,940	4,390	3,670	4,910	588	242	168	320	788	788
12	2,250	3,420	6,640	3,890	4,650	3,890	497	242	168	1,130	685	788
13	2,090	2,980	5,460	3,890	4,140	3,200	407	242	168	900	588	900
14	2,250	2,980	4,650	6,040	3,890	3,420	407	242	168	497	588	1,130
15	1,940	4,140	3,650	7,870	3,650	2,980	320	242	168	320	588	1,130
16	1,790	12,800	2,980	5,750	5,460	2,600	320	242	168	320	588	1,000
17	1,790	10,500	2,600	4,390	6,040	2,420	242	320	168	407	685	800
18	1,510	8,190	2,420	4,140	5,750	2,420	242	320	168	320	685	700
19	1,510	9,170	2,250	3,890	4,910	2,250	242	320	168	407	685	700
20	1,380	9,840	2,250	5,750	4,140	2,250	320	242	168	588	788	600
21	1,250	7,870	2,090	6,940	3,650	2,600	320	242	168	788	900	600
22	1,380	6,640	1,940	6,040	2,980	3,420	407	242	168	1,250	1,380	500
23	4,910	7,870	1,940	5,180	2,780	3,420	497	242	168	1,130	2,250	500
24	10,200	15,600	2,980	4,650	2,250	3,200	588	242	168	1,010	2,090	500
25	12,800	19,400	11,600	3,890	1,940	3,200	497	242	169	1,010	2,090	500
26	9,500	16,200	12,000	4,140	1,790	2,980	497	242	168	900	1,380	500
27	7,870	13,700	8,510	4,140	1,510	2,600	497	242	168	900	1,380	450
28	5,460	11,600	6,640	4,140	1,380	2,420	407	242	168	788	1,250	400
29	4,140	......	4,910	3,890	1,790	1,940	407	242	168	685	900	400
30	2,980	......	4,650	24,800	1,790	1,650	407	242	242	685	788	400
31	2,250	......	4,140	......	1,650	......	320	242	......	685	......	400

NOTE.— Open water conditions assumed, January 1 to March 31. Daily discharges January 1 to December 15 based on a well defined rating curve. Discharges December 16 to 31 estimated on the basis of the discharge from adjacent drainages.

Monthly Discharge of Allegheny River at Red House, N. Y.

[Drainage area, 1,640 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.
1909.					
January	13,200	685	4,080	2.49	2.87
February	19,400	1,650	8,000	4.88	5.08
March	12,000	1,940	4,960	3.02	3.48
April	24,800	2,980	5,440	3.32	3.70
May	34,600	1,380	7,500	4.57	5.27
June	5,180	1,250	2,860	1.74	1.94
July	1,380	242	593	.362	.42
August	320	242	257	.157	.18
September	242	168	185	.113	.13
October	1,250	168	544	.332	.38
November	2,250	407	877	.535	.60
December	1,130	400	644	.393	.45
The year	34,600	168	3,000	1.83	24.50

MISCELLANEOUS MEASUREMENT, ALLEGHENY RIVER DRAINAGE.

A current meter measurement of the discharge of Cattaraugus creek at Gowanda, N. Y., was made by C. C. Covert, August 16, 1909. The discharge was measured in the raceway near the dam and was found to be 97 second-feet. The stage of the stream, as indicated by the gage, was 1.42.

The foregoing records are such as are available for publication at the time of making this report.

Respectfully submitted,
ROBERT E. HORTON,
Resident Engineer.

INDEX OF ILLUSTRATIONS.

FACING PAGE.
Dam near Crescent 8
Dam and lock at Vischer's Ferry 10
Barge canal prism near Rochester, in rock section 12
Ladder-dredge, front view 14
Ladder-dredge, rear view, with belt conveyor 16
Cantilever excavator 18
Lock No. 2, at Waterford 52
Lock No. 5, near Waterford 54
Docking piers between locks near Waterford 56
Concrete docking between locks near Waterford 58
Mohawk river, from Crescent village 60
Dam at Vischer's Ferry 62
Lock No. 6, at Cranesville 64
Lock No. 11, dam No. 7, at Amsterdam 66
Dam at Stillwater, under construction 72
Dam at Stillwater, completed 74
Lock No. 5, at Northumberland 76
Hudson river at southern end of contract No. 1 78
Hudson river at Billing's island 80
Southern end of Fort Miller-Crocker's Reef land line 82
Lock No. 6, at Fort Miller 84
Completed canal prism near Fort Miller 86
Lock No. 8, near Fort Edward 90
Lock No. 11, at Comstock 92
Concrete bridge approach at Sylvan Beach 132
Lock No. 24, at Baldwinsville 136
Hydraulic dredge on contract No. 46 138
Dam near Delta 142
Hydraulic dredge on contract No. 47 188
Excavated channel, eastern end of contract No. 47 190
Dredge forming hydraulic embankment at Irondequoit creek crossing 192
General view of hydraulic embankment at Irondequoit creek crossing 194
Spreading embankment, Irondequoit creek crossing 196
Revolving excavator at work during navigation season 198
Revolving excavator at work during closed season 200
Steam-shovel and tipple excavating plant 202
Dipper-dredge excavating near Pendleton 204
Revolving excavator building dike, contract No. 19 206
Hydraulic dredge on contract No. 19 208
Discharge from hydraulic dredge 210

FACING PAGE.

Tests of concrete arches:
Fig. 1. Section through arch ring (page) 271
Fig. 2. Cross-sections of arch rings (page) 271
Fig. 3. Elevation of arch (page) 272
Fig. 4. Section of Fig. 3 (page) 273
Fig. 5. End view of Fig. 3 (page) 273
Fig. 6. Arch rings, before testing 274
Fig. 7. Arch rings, testing levers in place 274
Fig. 8. Arch rings, just beginning test 276
Fig. 9. End view, just beginning test 276
Fig. 10. Diagrams, showing kind of failure (page) 279
Fig. 11. Apparatus for testing cubes and prisms 282
Fig. 12. Diagram of failure of prisms 282
Fig. 13. Prisms, after testing 282

New York–Connecticut boundary line:
Old monument 288
Setting new monument 290
New monument in place 292
Diagram of Sault Ste. Marie canal lock 298
Memorial of early canal navigation 306

INDEX.

Annual Report of the State Engineer and Surveyor of New York, 1909.

PAGE.

Allegheny river drainage basin:
  Description 548
  Gaging stations:
    Gowanda, Cattaraugus creek 552
    Red House, Allegheny river 549–51
Alloway, Canandaigua outlet, gaging station 427–9
Aqueduct at Durhamville, engineering expenses 36, 176, 178
Assessment, Board of Equalization of, duties 8
Attorney-General, work for 8
Atwell, near, at North lake, West Canada creek basin, rain gage .. 465, 475, 477
Au Sable Forks, Au Sable river, east branch, current-meter measurement 324

Baldwinsville, above dam, Seneca river, gaging station 405, 406–7
Baldwinsville, below dam, Seneca river, gaging station 405–6
Ballintine bridge, Genesee river, gaging station 203, 348–9
Barge canal:
  Bureau of hydraulics 27
  Canal Terminal Commission 14
  Cayuga and Seneca canal, included 13–14
  Champlain canal:
    Contract No. 1 .... 45, 78–81, 123
    Contract No. 3 .... 45, 81–4, 123
    Contract No. 3–A 84
    Contract No. 7 .... 45, 85, 123
    Contract No. 15 .... 45, 92–4, 123
    Contract No. 16 .... 45, 85–6, 123
    Contract No. 25 .... 46, 94–5, 124
    Contract No. 26 .... 46, 86–7, 124
    Contract No. 27 .... 46, 87–91, 124
    Contract No. 32 .... 46, 91–2, 124
    Contract No. 68 .... 46, 75, 76–8, 124
    Contract No. 69 75
    Contract No. 70 .... 75, 76
    Contract No. 71 .... 75, 76

Barge canal — (*Continued*):
  Champlain canal — (*Continued*): PAGE.
    Contract No. 72 .... 75, 76
    Contract No. 73 .... 75, 76
    Contract No. 74 75
  Charting of streams and lakes, recommended........ 17–18, 19
  Contracts compared with appropriations........ 11
  Contracts completed, eastern division........ 38, 120
  Contracts pending by divisions:
    Eastern division 45–6, 123–4
    Middle division 45, 46–7, 182
    Western division 45, 47, 240
  Engineering expenses. (*See* "Engineering expenses.")
  Erie canal:
    Contract No. 2 .... 45, 53–4, 123
    Contract No. 4 .... 46, 131, 132–4, 182
    Contract No. 4a 131
    Contract No. 5 .... 46, 138, 182
    Contract No. 6 .... 47, 196–9, 240
    Contract No. 7 .... 45, 123, 131, 134, 182, 199, 240
    Contract No. 8 .... 45, 58, 60–1, 123
    Contract No. 9 .... 47, 203, 204–5, 240
    Contract No. 11 .... 45, 54–6, 123
    Contract No. 12 .... 46, 135–6, 138, 182
    Contract No. 13 .... 45, 68, 70, 123, 135, 136
    Contract No. 14 .... 45, 58–9, 65–7, 123
    Contract No. 16 .... 45, 123
    Contract No. 17 .... 45, 64–5, 123
    Contract No. 18 .... 45, 67, 68–70, 74, 123
    Contract No. 19 .... 47, 209, 210–11, 240
    Contract No. 20-A 45, 62, 67, 70, 123
    Contract No. 20-B 45, 62, 63, 123
    Contract No. 20-C 45, 62, 63, 123
    Contract No. 20-D 46, 58, 62, 63, 124
    Contract No. 21 196
    Contract No. 23 .... 47, 194, 196, 240
    Contract No. 29 .... 46, 68, 73–4, 124
    Contract No. 30 .... 46, 68, 72–3, 74, 124
    Contract No. 31 .... 46, 67, 70–2, 74, 124
    Contract No. 34 .... 38, 120
    Contract No. 38 .... 47, 194–5, 240
    Contract No. 40 .... 47, 206, 208–9, 240
    Contract No. 41 .... 47, 195, 240
    Contract No. 42 .... 46, 131–2, 134, 182
    Contract No. 43 .... 131, 132, 134
    Contract No. 44 .... 131, 132, 134
    Contract No. 45 .... 46, 135, 136–7, 182
    Contract No. 46 .... 46, 138, 182
    Contract No. 47 .... 47, 190, 191, 192–3, 240

- Barge canal — (*Continued*):
  - Erie canal — (*Continued*): PAGE.
    - Contract No. 48 190, 191, 192
    - Contract No. 49 190, 191, 192
    - Contract No. 57 135, 137
    - Contract No. 60 47, 196, 199–201, 240
    - Contract No. 61 47, 196, 202–3, 240
    - Contract No. 62 203, 204
    - Contract No. 63 194
    - Contract No. 64 47, 203, 204, 205–6, 240
    - Contract No. 65 203, 204, 269
    - Contract No. 67 206, 208
    - Contract No. 76 191, 192
    - Contract No. 77 191, 192
    - Contract, Delaware Ave., Tonawanda, to Niagara river 209
  - Hudson river improvement by United States 12–13
  - Hydraulic investigation for 17
  - Inspection of steel, iron and metal 14–15
  - Lock construction 16
  - Maintenance 17, 19
  - Oswego canal:
    - Contract No. 10 46, 139–40, 182
    - Contract No. 35 46, 139, 140–1, 182
    - Contract No. 37 139
    - Contract No. 39 139
    - Contract No. 53 46, 139, 141, 182
  - Park sites, recommendations 19
  - Portions under contract 11–12
  - Recommendations 18–19
  - Record for 1909 10–11
  - Report of State Engineer 9–19
  - Report on stream gaging 315
  - Reports of division engineers:
    - Eastern division 52–95
    - Middle division 130–44
    - Western division 189–211
  - Residencies, by divisions:
    - Eastern division 52
    - Middle division 130–1
    - Western division 189–90
  - Residencies, reports:
    - Champlain, No. 1 52, 75–8
    - Champlain, No. 2 52, 78–92
    - Champlain, No. 3 52, 92–5
    - Erie, No. 1 52, 53–7
    - Erie, No. 2 52, 57–62
    - Erie, No. 3 52, 63–7
    - Erie, No. 4 52, 67–74
    - Erie, No. 5 131–4

Barge canal — (*Continued*):
  Residencies, reports — (*Continued*): PAGE.
    Erie, No. 6 135–7
    Erie, No. 7 138
    Erie, No. 8 .... 189, 190–3
    Erie, No. 9 193
    Erie, No. 9-A 190, 193–6
    Erie, No. 9-B 190, 196–203
    Erie, No. 10-A 190, 203–6
    Erie, No. 10-B 190, 206–9
    Erie, No. 11 .... 190, 209–11
    Oswego, No. 1.......... 139–41
    Water-supply 142–4
  Status of work.......... 10
  Water-power development 18
  Water-supply:
    Contract No. 50 142
    Contract No. 51 142
    Contract No. 55 .... 47, 142–4, 182
"Barge Canal Bulletin," report on.......... 15–16
Batten kill, Battenville, Hudson river, gaging station.......... 508
Battle Island, above dam, Oswego river, gaging station.......... 367
Battle Island, below dam, Oswego river, gaging station.......... 366
Battle Island, opposite, Oswego river, gaging station.......... 364–5
Belgium, highway bridge, Seneca river, gaging station.......... 400
Belgium, near, Gascon reef, Seneca river, gaging station.......... 399
Binghamton, Court street bridge, Chenango river, gaging station..... 541–4
Binghamton, Washington street bridge, Susquehanna river, gaging station 539–41
Black creek at Gray, West Canada creek basin, rain gage.......... 475
Black creek. (*See* "Waterhouse creek," Oswego river basin.)
Black River canal:
  Engineering expenses, ordinary repairs.......... 35, 166, 178
  Uninterrupted navigation 127
Black river drainage basin:
  Description 338–9
  Gaging stations:
    Felts Mills, Black river.......... 339–41
    Moose River village, Moose river.......... 341–3
"Blue line" surveying and monumenting, recommended.......... 30
Boards and commissions, State Engineer's duties.......... 7–8
Boundary lines and monuments, State Engineer's duties.......... 8, 23
Boundary lines, State:
  Canada 23
  Connecticut 23, 24, 285–94
  Massachusetts 23
  New Jersey 23
  Pennsylvania 23

Boundary lines, State — (*Continued*): PAGE.
- Recommendations 23, 24
- Statistics 23
- Vermont 23, 24

Bouquet river, Willsboro, current-meter measurement 324

Braddock's dam, Oswego river. (*See* "Battle Island.")

Brewerton, highway bridge, Oneida river, gaging station 384

Bridge designer, report of tests on concrete arches 268, 269–83

Bridges:
- Buffalo, Georgia street 188, 235, 236, 266
- Bureau of:
  - Duties 22–3
  - Engineering expenses 36, 115, 119
  - Report 266–8
- Cazenovia, Mill street 127, 175, 178, 266
- Rochester, Allen street 188, 189, 234, 236, 239, 266
- Rochester, Lyell avenue 188–9, 234, 236, 237, 266
- Seneca Falls, Ovid street 128, 175, 178, 266
- Syracuse, North Salina street 128, 175, 178
- Utica, Seneca street 128, 176, 178, 266
- Waterford, Mohawk street 116, 119

Buffalo, Georgia street bridge 37, 188, 235, 236, 266

Bureau:
- Bridges 22–3, 36, 266–8
- Hydraulics 27, 313–552
- Land 263–5

Burgoyne, Fish creek, gaging station 508

Buskirk, Hoosic river, gaging station 502

Butternut creek, near Jamesville, description and gaging station 396–7

Canada, boundary line 23

Canadian canal, accident at Sault lock 16

Canadice lake, description and gaging station near Hemlock 352–3

Canajoharie, Mohawk river, gaging station 455

Canal:
- Duties of State Engineer 7
- Maintenance 9
- Work of the eastern division 51
- Work of middle division 127
- Work of the western division 187

Canal, Barge. (*See* "Barge canal.")

Canal Board:
- Duties 8
- Power pertaining to water-power development, recommendation . 19

Canal lock, relic at Little Falls, recommendation 31

Canal Terminal Commission, duties and members 8, 14

Canandaigua outlet:
- Description 426–7

Canandaigua outlet — (*Continued*):
- Gaging stations: PAGE.
  - Alloway 427–9
  - Canandaigua 429

Canvassers, State Board of, duties 8
Catskill creek, South Cairo, gaging station 436
Cattaraugus creek, current-meter measurement at Gowanda 552
Caughdenoy, above lock, Oneida river, gaging station 383
Caughdenoy, below lock, Oneida river, gaging station 382
Cayuga, above West Mud lock, Seneca river, gaging station 413–14

Cayuga and Seneca canal:
- Engineering expenses:
  - Ordinary repairs 35, 166, 178
  - Survey 37, 117, 119, 176–7, 178
- Gaging stations 251
- Included in Barge canal system 13–14
- Report on survey 249–52
- Report to Senate 243–8
- Routes:
  - Cayuga canal 249, 250
  - Seneca canal 250–1
  - Seneca river, east and west line 250–1
  - Seneca river, north and south line 251
- Survey 129, 249–52
- Uninterrupted navigation 127

Cayuga, below West Mud lock, Seneca river, gaging station 413
Cayuga lake, Ithaca, gaging station 414–15
Cayuga lake, water records 129–30, 183
Cazenovia lake, capacity 389
Cazenovia, Mill street bridge 36, 38, 175, 178, 179, 266

Cement:
- Portland, use on canals 9
- Report of tests 255–61
- Tests, laboratory 20

Central Bridge, Schoharie creek, gaging station 450

Champlain canal:
- Engineering expenses:
  - Barge canal construction 35, 105–8, 119
  - Ordinary repairs 35, 97, 119
- Portions under contract 12
- (*See also* "Barge canal" and "Contracts.")

Charting of streams and lakes, recommended 17–18, 19
Chemung river, description and gaging station at Chemung 544–7
Chenango river, description and gaging station at Binghamton 541–4
Chittenango creek, description and gaging station at Chittenango 388–92
Civil Service Law, amendment recommended 31

Clyde river:
- Description 422

Clyde river — (*Continued*):
  Gaging stations: PAGE.
    Clyde 423
    Lyons 424
Cohoes, Mohawk river, gaging station 441–2
Commissions and boards, State Engineer's duties 7–8
Concrete arches, tests of, report 268, 269–83
Concrete, use on canals 9
Connecticut boundary line 23, 285–94
Contents, table of 5
Contracts:
  Barge canal:
    Champlain canal:
      No. 1 . . . . . 45, 78–81, 123
      No. 3 . . . . . 45, 81–4, 123
      No. 3-A 84
      No. 7 . . . . . 45, 85, 123
      No. 15 . . . . . 45, 92–4, 123
      No. 16 . . . . . 45, 85–6, 123
      No. 25 . . . . . 46, 94–5, 124
      No. 26 . . . . . 46, 86–7, 124
      No. 27 . . . . . 46, 87–91, 124
      No. 32 . . . . . 46, 91–2, 124
      No. 68 . . . . . 46, 75, 76–8, 124
      No. 69 75
      No. 70 . . . . . 75, 76
      No. 71 . . . . . 75, 76
      No. 72 . . . . . 75, 76
      No. 73 . . . . . 75, 76
      No. 74 75
    Completed during the year 38, 120
    Erie canal, eastern division:
      No. 2 . . . . . 45, 53–4, 123
      No. 7 . . . . . 45, 123
      No. 8 . . . . . 45, 58, 60–1, 123
      No. 11 . . . . . 45, 54–6, 123
      No. 13 . . . . . 45, 68, 70, 123
      No. 14 . . . . . 45, 58–9, 65–7, 123
      No. 16 . . . . . 45, 123
      No. 17 . . . . . 45, 64–5, 123
      No. 18 . . . . . 45, 67, 68, 74, 123
      No. 20-A 45, 62, 67, 70, 123
      No. 20-B 45, 62, 63, 123
      No. 20-C 45, 62, 63, 123
      No. 20-D 46, 58, 62, 63, 124
      No. 29 . . . . . 46, 68, 73–4, 124
      No. 30 . . . . . 46, 68, 72–3, 74, 124
      No. 31 . . . . . 46, 67, 70–2, 74, 124
      No. 34 . . . . . 38, 120

Contracts — (*Continued*):
  Barge canal — (*Continued*):
    Erie canal, middle division: PAGE.
      No. 4 ... 46, 131, 132–4, 182
      No. 4-A ... 131
      No. 5 ... 46, 138, 182
      No. 7 ... 45, 131, 134, 182
      No. 12 ... 46, 135–6, 138, 182
      No. 13 ... 45, 135, 136, 182
      No. 42 ... 46, 131–2, 134, 182
      No. 43 ... 131, 132, 134
      No. 44 ... 131, 132, 134
      No. 45 ... 46, 135, 136–7, 182
      No. 46 ... 46, 138, 182
      No. 57 ... 135, 137
    Erie canal, western division:
      No. 6 ... 47, 196–9, 240
      No. 7 ... 45, 199, 240
      No. 9 ... 47, 203, 204–5, 240
      No. 19 ... 47, 209, 210–11, 240
      No. 21 ... 196
      No. 23 ... 47, 194, 196, 240
      No. 38 ... 47, 194–5, 240
      No. 40 ... 47, 206, 208–9, 240
      No. 41 ... 47, 195, 240
      No. 47 ... 47, 190, 191, 192–3, 240
      No. 48 ... 190, 191, 192
      No. 49 ... 190, 191, 192
      No. 60 ... 47, 196, 199–201, 240
      No. 61 ... 47, 196, 202–3, 240
      No. 62 ... 203, 204
      No. 63 ... 194
      No. 64 ... 47, 203, 204, 205–6, 240
      No. 65 ... 203, 204, 269
      No. 66 ... 47, 206–7, 240
      No. 67 ... 206, 208
      No. 76 ... 191, 192
      No. 77 ... 191, 192
      Delaware Ave., Tonawanda, to Niagara river ... 209
    Oswego canal:
      No. 10 ... 46, 139–40, 182
      No. 35 ... 46, 139, 140–1, 182
      No. 37 ... 139
      No. 39 ... 139
      No. 53 ... 46, 139, 141, 182
    Pending, September 30, 1909, by divisions:
      Eastern division ... 45–6, 123–4
      Middle division ... 45, 46–7, 182
      Western division ... 45, 47, 240

Contracts — (*Continued*):
  Barge canal — (*Continued*): PAGE.
    Portions under contract 11–12
    Water-supply:
      No. 50 142
      No. 51 142
      No. 55 .... 47, 142–4, 182
  Cazenovia, Mill street bridge, completed 38, 179
  Highway improvement, completed, to Feb. 17, 1909, by divisions:
    Eastern division 39, 120
    Middle division 39–40, 145–64, 179–80
    Western division 40, 212–26, 238
  Highway improvement, pending, February 17, 1909, by divisions:
    Eastern division 41–3, 121–2
    Middle division 43–4, 181
  Rochester, Allen street bridge, pending Sept. 30, 1909 .... 188, 189, 239
  Rochester, Lyell avenue bridge, completed 38, 188–9, 237
  Skaneateles lake outlet, protection wall, completed 38, 179
  Special works, completed during year 38, 179, 237
  Syracuse, Catharine street bridge, pending Sept. 30, 1909 182
  Syracuse, North Salina street bridge, completed 38, 179
Corinth, Hudson river, gaging station 521–2
Court of Claims:
  Recommendation concerning 21
  State Engineer's duties and work for 8
  Surveys for 20–21, 51, 129, 187
Court of Claims, surveys, engineering expenses:
  Eastern division 37, 116, 119
  Middle division 37, 177, 178
  Western division 37, 235, 236
Crocker's Reef dam, Hudson river, gaging station 514–15
Cross lake, above, highway bridge, Jordan, Seneca river, gaging station. 409–10
Cross lake, water records 129–30, 183

Deerfield reservoir, near Utica, Mohawk river basin, rain gage 481
DeGraff, H. W., Deputy State Engineer 32, 252, 260, 294
Delaware river drainage basin:
  Description 524–5
  Gaging stations:
    Godeffroy, Neversink river 534–6
    Hancock, East branch, Delaware river 525–8
    Hancock, West branch, Delaware river 528–30
    Port Jervis, Delaware river 531–3
    Rio, Mongaup river 537–8
Delta, above dam, Mohawk river, gaging station 491–2
Delta, below dam, Mohawk river, gaging station 490–1
Delta, near lock No. 7, Mohawk river, gaging station 489–90
Depositories, fireproof, recommended 29

- Division engineer, reports: PAGE.
  - Eastern division 49–124
  - Middle division 125–84
  - Western division 185–240
- Dolgeville, East Canada creek, gaging station 456–8
- Drainage areas. (*See* names of localities.)
- Dresden, landing and pier:
  - Engineering expenses 37, 235, 236
  - Survey 188
- Dunsbach Ferry, Mohawk river, gaging station 442–4
- Durhamville aqueduct, engineering expenses 36, 176, 178

- Eagle bridge, Hoosic river, gaging station 502–4
- East Canada creek, Dolgeville, gaging station 456–8
- Eastern division:
  - Engineering expenses. (*See* "Engineering expenses.")
  - Engineer's report 49–124
  - Location 51
- Engineering expenses:
  - Eastern division:
    - Barge canal construction:
      - Champlain canal 35, 105–8, 119
      - Erie canal 35, 101–5, 119
      - Head office account 35, 98–101, 119
    - Bureau of bridges 36, 115, 119
    - Cayuga and Seneca canal survey 37, 117, 119
    - Court of Claims surveys 37, 116, 119
    - Hydrographic survey 37, 118, 119
    - Improvement of public highways 36, 108–14, 119
    - Maintenance and repairs of highways 36
    - "Money system" repairs of highways 36, 114, 119
    - Monuments and maps, examination 37, 115, 119
    - Ordinary repairs:
      - Champlain canal 35, 97, 119
      - Erie canal 35, 97, 119
    - Special surveys 37, 119
    - Summary 37, 119
    - Topographic survey 37, 117–18, 119
    - Waterford, Mohawk street bridge 37, 116, 119
  - Middle division:
    - Barge canal construction:
      - Erie canal 35, 166–9, 178
      - Oswego canal 35, 169–71, 178
    - Cayuga and Seneca canal survey 37, 176–7, 178
    - Cazenovia, Mill street bridge 36, 175, 178
    - Court of Claims surveys 37, 177, 178
    - Durhamville aqueduct 36, 176, 178
    - Improvement of public highways 36, 171–4, 178

Engineering expenses — (*Continued*):
  Middle division — (*Continued*): PAGE.
    Maintenance and repairs of highways 36, 174, 178
    Ordinary repairs:
      Black River canal 35, 166, 178
      Cayuga and Seneca canal 35, 166, 178
      Erie canal 35, 165, 178
    Seneca Falls, Ovid street bridge 36, 175, 178
    Special surveys 37, 177, 178
    Special work 36, 175–6, 178
    Summary 37, 178
    Syracuse, North Salina street bridge 36, 175, 178
    Utica, Seneca street bridge 36, 176, 178
  Summary of State by divisions 37
  Western division:
    Barge canal construction, Erie canal 35, 227–31, 236
    Buffalo, Georgia street bridge 37, 235, 236
    Court of Claims surveys 37, 235, 236
    Dresden boat landing and pier 37, 235, 236
    Improvement of public highways 36, 232–3, 236
    Keuka lake outlet, lighthouse 37, 236
    Ordinary repairs, Erie canal 35, 227, 236
    Rochester, Allen street bridge 36, 234, 236
    Rochester, Lyell avenue bridge 36, 234, 236
    Special surveys 37, 235–6
    Special works 36, 234, 236
    Summary 37, 236
Erie canal:
  Engineering expenses:
    Barge canal construction 35, 101–5, 119, 166–9, 178, 227–31, 236
    Ordinary repairs 35, 97, 119, 165, 178, 227, 236
  Gaging stations:
    Little Falls 462
    Pendleton, change bridge 431
    Rochester, aqueduct 350
    Tonawanda, Main street bridge 431–2
  Portions under contract 11–12
  Uninterrupted navigation 127
  (*See also* "Barge canal" and "Contracts.")
Erieville reservoir, capacity 389
Esopus weir, Olive Bridge, gaging station 436–7
Euclid, Oneida river at Schroeppel's bridge, gaging station 379–80

Fayetteville, Limestone creek, gaging station 393–4
Felts Mills, Black river, gaging station 339–41
Fireproof depositories, recommended 29
Fish creek, Burgoyne, Hudson river, gaging station 508
Fish creek, Sylvan Beach, Oneida lake, gaging station .. 385

PAGE.

Fonda, Fultonville bridge, Mohawk river, gaging station 453–4
Fort Edward, Bridge street, Hudson river, gaging station 517–18
Fort Edward, International Paper Co.'s dam, Hudson river, gaging station 518–20
Fort Edward, mouth of Snook kill, Hudson river, gaging station 516–17
Fort Hunter, Schoharie creek, gaging station 449
Fort Miller, above dam, Hudson river, gaging station 513–14
Fort Miller, below dam, Hudson river, gaging station 512–13
Fort Miller, below, Hill street, Hudson river, gaging station 511–12
Fort Miller, mouth of Moses kill, Hudson river, gaging station 515–16
Fort Montgomery, Richelieu river, gaging station 324–6
Fort Plain, Mohawk river, gaging station 455–6
Fox Ridge, R. R. bridge, Seneca river, gaging station 411–12
Fulton, above lower dam, Oswego river, gaging station 369
Fulton, above upper dam, Oswego river, gaging station 370
Fulton, mouth of Waterhouse creek, Oswego river, gaging station 368
Fultonville bridge, Fonda, Mohawk river, gaging station 453–4

Gaging methods:
- Barge canal stations 315–16
- Coöperative stations 316
- Current-meter rating 317–18
- Current meters 317–18
- Dams and mills 316–17
- Gages 316
- Rating tables 319
- Readings 318–19
- Water-wheels, turbine 317

Gaging of streams:
- Accuracy of individual current-meter measurements 320
- Effect of diversion for canal 320
- Ice conditions 317, 319–20
- Maximum discharge 321
- Methods. (*See* "Gaging methods.")
- Observers 321
- Report on 313–552
- Report on coöperation with U. S. hydrographic survey 26–7
- Sources of error 319–20
- (*See also* names of drainage basins, streams and localities.)

Gaging stations, report on. (*See* names of drainage basins, streams and localities.)

Ganargua creek:
- Description 422
- Gaging stations:
  - Newark, north of 425
  - Palmyra, near 425–6

Gascon reef, near Belgium, Seneca river, gaging station 399

Genesee river drainage basin: PAGE.
  Description ... 344
  Drainage areas ... 345
  Gaging stations:
    Ballintine's bridge, Genesee river ... 348–9
    Hemlock, Canadice lake outlet ... 352–3
    Mt. Morris, Genesee river ... 350–2
    Rochester, Elmwood avenue, Genesee river ... 346–8
Geneva, above regulation works, Seneca river, gaging station ... 421–2
Geneva, below regulation works, Seneca river, gaging station ... 420–1

Geological Survey, U. S.:
  Coöperation with ... 8
  Report on coöperative stream gaging ... 315
  Report on coöperative topographic survey ... 307–11
Glens Falls, above feeder dam, Hudson river, gaging station ... 521
Godeffroy, Neversink river, gaging station ... 534–6
Gowanda, Cattaraugus creek, current-meter measurement ... 552
Graefenburg hydrophysical station, near Utica, Mohawk river basin. 481
Grant, near Twin Rock bridge, West Canada creek, gaging station .. 472–5
Grant, near Twin Rock bridge, West Canada creek basin, rain gage ... 465, 475, 477
Gray, Black creek, West Canada creek basin, rain gage ... 475

Hancock, East branch, Delaware river, gaging station ... 525–8
Hancock, West branch, Delaware river, gaging station ... 528–30
Head office account, Barge canal construction, engineering expenses ... 35, 98–101, 119
Hemlock, Canadice lake outlet, gaging station ... 352–3
Herkimer, Mohawk river, gaging station ... 462–4
Herkimer, near, Kast bridge, West Canada creek, gaging station ... 465–7
Higbie-Armstrong law. (*See* "Improvement of public highways.")

Highway Commission:
  Transfer of work to ... 19, 96, 127, 187
  Work for ... 20, 255
Highway improvement. (*See* "Improvement of public highways.")
Hinmansville bridge, Oswego river, gaging station ... 374
Hoffmeister, West Canada creek basin, rain gage ... 465, 475, 476
Honnedaga, West Canada creek basin, rain gage ... 465
Hoosick Falls, Hoosic river, gaging station ... 504–5

Hoosic river drainage basin:
  Description ... 501–2

  Gaging stations:
    Buskirk, Hoosic river ... 502
    Eagle Bridge, Hoosic river ... 502–4
    Hoosick Falls, Hoosic river ... 504–5
Horseshoe dam, above site of, Oswego river, gaging station ... 373
Horseshoe dam, below site of, Oswego river, gaging station ... 372
Hudson river canalization, Federal improvement, recommended ... 12–13, 19

PAGE.
Hudson river drainage basin:
  Description 433
  (*See also* " Upper Hudson drainage basin," " Lower Hudson drainage basin " *and* " Mohawk river drainage basin.")
Hydraulic investigation for Barge canal.......................... 17
Hydraulics, bureau of.. 27
Hydrographic survey, engineering expenses...................... 37
Hydrophysical station. (*See* "Graefenburg hydrophysical station.")

Improved public highways, maintenance and repairs, eastern division 36, 119
Improvement of public highways:
  (For names of roads, *see* " Improvement of public highways, Contracts completed, *and* Contracts pending." Roads completed before current year not indexed by name.)
  Contracts completed:
    Broome county:
      Conklin, No. 421.............................. 39, 152–3, 180
      Lisle–Center Lisle, No. 445...................... 39, 155, 180
      Maine road, No. 374............................ 39, 150, 180
      Union–Maine, No. 275 .... 39, 146, 179
      Vestal, No. 420................................ 39, 152, 180
    Cattaraugus county:
      Orleans–Allegany, sections 1 and 2, No. 601...... 40, 222, 238
      Portville–Olean, section 2, No. 731.............. 40, 225, 238
    Cayuga county:
      Auburn–Elbridge, No. 592........................ 39, 160, 180
      Auburn–Seneca Falls, section 1, No. 590........... 39, 159, 180
      Fleming, No. 384............................ 39, 151–2, 180
      Moravia–Niles, No. 591...................... 39, 159–60, 180
    Chautauqua county:
      Falconer–Kennedy, No. 698...................... 40, 224, 238
    Chemung county:
      Horseheads–Corning, No. 358 .... 40, 214, 238
      Wellsburg, No. 355............................ 40, 213, 238
    Chenango county:
      Norwich–Kings Settlement, No. 597.............. 40, 161, 180
      Norwich–Preston, No. 598..................... 40, 161–2, 180
      Norwich–South New Berlin, section 1, No. 596... 40, 160–1, 180
    Cortland county:
      Cortland–Homer, No. 208............... .... 39, 179
      Harford, No. 379............................ 39, 150–1, 180
      Homer–Tully, section 1, No. 510.................. 39, 157, 180
      State road, Homer, No. 380...................... 39, 151, 180
    Dutchess county:
      Poughkeepsie–Pleasant Valley, No. 549.............. 39, 120
    Erie county:
      Alden–Town line, Clinton street–Marilla, No. 529. 40, 220, 238
      Base Line–Grand Island, section 1, No. 530...... 40, 220, 238

Improvement of public highways — (*Continued*):
Contracts completed — (*Continued*):
Erie county — (*Continued*): PAGE.
Base Line–Grand Island, section 2, No. 531 ...... 40, 221, 238
Base Line–Grand Island, section 3, No. 532 ...... 40, 221, 238
Clinton street, section 1, No. 371 .... 40, 214, 238
Clinton street, section 2, No. 372 .... 40, 215, 238
Goodrich, No. 373 .... 40, 215, 238
Lawton–Gowanda, No. 525 .... 40, 219, 238
North Collins–Lawton, No. 524 .... 40, 219, 238
Skinnersville–New Home Bridge, No. 584 .... 40, 221, 238

Jefferson county:
Adams–Henderson, section 2, No. 234 .... 39, 179
State, section 2, No. 426 .... 39, 153, 180
Watertown–Carthage, section 3, No. 428 .... 39, 153–4, 180

Madison county:
Chittenango–Oneida, section 2, No. 726 .... 40, 163–4, 180
Georgetown, No. 339 .... 39, 149, 180
Syracuse turnpike, No. 337 .... 39, 148, 179

Monroe county:
Buffalo, section 3, No. 402 .... 40, 217, 238
Chili, section 1, No. 254 .... 40, 212, 238
Chili, section 2, No. 255 .... 40, 212, 238
Churchville–Riga, No. 403 .... 40, 217, 238
Clover street, section 1, No. 294 .... 40, 213, 238
Clover street, section 2, No. 474 .... 40, 218, 238
Latta, No. 399 .... 40, 216, 238

Niagara county:
Lewiston–Dickersonville, No. 617 .... 40, 223–4, 238
North Tonawanda–Sanborn, No. 643 .... 40, 224, 238

Oneida county:
Augusta, Augusta section, No. 368 .... 39, 149–50, 180
Augusta, Lowell and Spencer sections, No. 438 .. 39, 154–5, 180
Mohawk river, Rome section, No. 560 .... 39, 158, 180
Rome–Northwestern, section 1, No. 561 .... 39, 158–9, 180
Utica–Bridgewater, No. 559 .... 39, 157, 180
Utica–Oneida Castle, section 1, No. 271 .... 39, 145, 179

Onondaga county:
Elbridge, No. 487 .... 39, 156–7
Skaneateles–Hamilton, No. 330 .... 39. 147, 179
Skaneateles–Spafford, No. 431 .... 39, 154, 180
Skaneateles, West Lake, sections 1, 2 and 3, No. 486 .... 39, 156, 180

Ontario county:
Manchester–Clifton Springs, No. 607 .... 40, 222–3, 238
Phelps–Clifton Springs, No. 608 .... 40, 223, 238
West Bloomfield–Honeoye Falls, No. 485 .... 40, 218, 238

Improvement of public highways — (*Continued*):
  Contracts completed — (*Continued*):
    Orange county: PAGE.
      Craigville, undergrade crossing, No. 154-B............ 39, 120
    Orleans county:
      Five Corners–Kuckville, section 2, No. 387........ 40, 216, 238
    Oswego county:
      Granby, No. 653 ....40, 163, 180
      Syracuse–Watertown, No. 278.................. 39, 146–7, 179
      West Oswego river, No. 279.................... 39, 147, 179
    Seneca county:
      Seneca river, north side, No. 273................ 39, 145–6, 179
    Steuben county:
      Big Flats–Gibson, No. 742............ .... 40, 225, 238
    Tompkins county:
      Catskill turnpike, section 2, No. 338.............. 39, 149, 179
      Cayuga Heights, No. 336........................ 39, 148, 179
      Cayuga Heights–Hanshaw Corners, No. 606........ 40, 162, 180
      Trumansburg–Ithaca, No. 616.................. 40, 162–3, 180
      Wyckoff, No. 455............................ 39, 155–6, 180
  Contracts completed during year, by divisions:
    Eastern division 39, 120
    Middle division.......................... 39–40, 145–64, 179–80
    Western division 40, 212–26, 238
  Contracts pending, February 17, 1909:
    Albany county:
      Indian Fields–Dormansville, No. 646................. 42, 122
      Troy–Schenectady, section 3, No. 604................ 42, 122
      Troy–Schenectady, section 4, No. 630................ 42, 122
    Cayuga county:
      Auburn–Owasco, No. 614............................ 44, 181
      Cato–Meridian–Baldwinsville, No. 684............... 44, 181
    Chenango county:
      Smyrna–Otselic, No. 599........................... 44, 181
    Clinton county:
      Champlain–Perrys Mills, No. 652.................... 42, 122
    Columbia county:
      Hudson–Hollowville, No. 650........................ 42, 122
    Cortland county:
      Cortland–Dryden, section 2, No. 535.................. 43, 181
      Homer–Tully, section 2, No. 595..................... 44, 181
      McGrawville, No. 378.............................. 43, 181
      State road, Scott, No. 381.......................... 43, 181
    Delaware county:
      Delhi–Bloomville, No. 747.......................... 43, 122

Improvement of public highways — (*Continued*):
Contracts pending, February 17, 1909 — (*Continued*):
Dutchess county: PAGE.
Pawling-Dover town line, No. 612 .... 42, 122
Wicopee-Beekman, No. 627 .... 42, 122
Essex county:
Aiden Lair-Newcomb, section 2, No. 756 .... 43, 122
Taylor-Schroon Lake village, No. 745 .... 43, 122
Franklin county:
Malone-Ft. Covington, section 2, No. 702 .... 42, 122
Fulton county:
Johnstown-Broadalbin, section 2, No. 543 .... 41, 121
Mayfield-Northville, section 2, No. 541 .... 41, 121
Greene county:
Greenville-Coxsackie, section 1, No. 796 .... 43, 122
Greenville-Coxsackie, section 2, No. 719 .... 42, 122
Hamilton county:
Lake Pleasant-Speculator, No. 277 .... 41, 121
Herkimer county:
Manheim-Center Salisbury, No. 463 .... 41, 121
Old Forge-McKeever, No. 462 .... 41, 121
Salisbury Center-Stratford, No. 464 .... 41, 121
Jefferson county:
Redwood-Alexandria Bay, section 2, No. 236 .... 43, 181
Watertown-Theresa, section 3, No. 423 .... 43, 181
Montgomery county:
Canajoharie-Sharon Springs, section 2, No. 347 .... 41, 121
Canajoharie-Sprout Brook, No. 345 .... 41, 121
Sprakers-Rural Grove, section 1, No. 304 .... 41, 121
Sprakers-Rural Grove, section 2, No. 346 .... 41, 121
Nassau county:
Willets-East Williston-Westbury Pond, No. 547 .... 42, 121
Oneida county:
Rome-Northwestern, section 2, No. 562 .... 44, 181
Rome-Taberg, No. 563 .... 44, 181
Onondaga county:
Belle Isle, No. 488 .... 43, 181
Cicero-South Bay, No. 452 .... 43, 181
Coleman Hill, section 1, No. 245 .... 43, 181
Collamer, No. 348 .... 43, 181
East Lake, section 2, No. 293 .... 43, 181
West Lake, section 2, No. 292 .... 43, 181
Orange county:
Hyland Mills-Monroe, No. 413 .... 41, 121
Port Jervis-Sullivan county line, section 1, No. 412 .... 41, 121
West Point-Cornwall, No. 411 .... 41, 121

Improvement of public highways — (*Continued*):
- Contracts pending, February 17, 1909 — (*Continued*):
  - Oswego county: PAGE.
    - Minetto–Fulton, No. 451 .... 43, 181
    - Phoenix–Pennellville, No. 450 .... 43, 181
  - Otsego county:
    - Edmeston–West Burlington–Kelsey Corners, No. 677 ... 42, 122
    - Milford Center–Milford, No. 674 .... 42, 122
    - Otego–Oneonta, No. 675 .... 42, 122
    - Richfield Springs–Schuyler Lake, No. 784 .... 43, 122
    - Sidney–Unadilla, No. 708 .... 42, 122
  - Putnam county:
    - Carmel–Kent, No. 570 .... 42, 121
    - Towners Corners–County line, No. 585 .... 42, 121
  - Rensselaer county:
    - Schodack Center–Nassau, No. 536 .... 41, 121
    - Spring Ave., Troy–Poestenkill, No. 571 .... 42, 121
    - Troy–Speigletown, No. 504 .... 41, 121
  - Rockland county:
    - Monsey–Egypt Corners, No. 690 .... 42, 122
  - Saratoga county:
    - Saratoga–Gansevoort, No. 442 .... 41, 121
  - Schenectady county:
    - South Schenectady–Mariaville, No. 788 .... 43, 122
  - Seneca county:
    - Reservation, Fayette section, No. 320 .... 43, 181
  - St. Lawrence county:
    - Massena–Waddington, sections 1, 2, 3 and 4, No. 521 .. 43, 181
    - Ogdensburg–Canton, section 1, No. 732 .... 44, 181
    - Ogdensburg–Canton, section 2, No. 733 .... 44, 181
  - Suffolk county:
    - Huntington–Amityville, No. 794 .... 43, 122
  - Sullivan county:
    - Jeffersonville–Kenoza Lake–Fosterdale, No. 795 .... 43, 122
  - Tompkins county:
    - Catskill turnpike, No. 483 .... 43, 181
  - Warren county:
    - North Creek–County Line, No. 736 .... 43, 122
  - Washington county:
    - Whitehall–Ft. Ann town line, No. 723 .... 42, 122
  - Westchester county:
    - Amawalk–Woods Bridge, No. 769 .... 43, 122
    - Goldens Bridge–Turk Hill, No. 770 .... 43, 122
    - Ossining–Kitchawan, No. 768 .... 43, 122
- Contracts pending February 17, 1909, by divisions:
  - Eastern division 41–3, 121–2
  - Middle division 43–4, 181

Improvement of public highways — (*Continued*):
- Engineering expenses. (*See* "Engineering expenses.") PAGE.
- Recapitulation by counties, middle division 164
- Report of State Engineer 19
- Reports of division engineers:
  - Eastern division 96
  - Middle division 145–64
  - Western division 212–26
- Transfer of work to Highway Commission 19
- Work of eastern division 51
- Work of middle division 127
- Work of western division 187

Indian Lake village, Indian river, gaging station 524
Iron used on canals, inspection of 14–15
Ithaca, Cayuga lake, gaging station 414–15

Jack's reef, above, Jordan, Seneca river, gaging station 407–8
Jack's reef, at foot of, Memphis, Seneca river, gaging station 407–8
Jamesville, near, Butternut creek, gaging station 396–7
Jordan, above Jack's reef, Seneca river, gaging station 408–9
Jordan, at highway bridge above Cross lake, Seneca river, gaging station 409–10

Kast bridge, near Herkimer, West Canada creek, gaging station 465–7
Kenwood, Oneida creek, gaging station 386–8
Keuka lake outlet, lighthouse 37, 188, 236
Kinderhook creek, Rossman, gaging station 434–5

Lake Champlain drainage basin:
- Description 322–3
- Drainage area 323–4
- Gaging stations:
  - Au Sable Forks, Au Sable river 324
  - Fort Montgomery, Richelieu river 324–6
  - Plattsburg, near, Saranac river 329–31
  - Willsboro, Bouquet river 324

Lake Ontario drainage:
- Description 338
- (*See also* "Black river drainage basin," "Genesee river drainage basin," "Oswego-Oneida-Seneca river drainage basin," *and* "Niagara river drainage.")

Lakes and rivers, canalized, charting recommended 17–18
Land Board, State Engineer's duties and work for 8

Land Bureau:
- Recommendations concerning 22
- Report 263–5
- Sale of State lands 21
- Value of records 21

PAGE.
Landing and pier, Dresden 138, 235, 236
Land Office, Board of Commissioners, duties 8
Land records, value of 21
Landreth, William B., Special Deputy State Engineer 32, 260, 315
Land sales, remedial legislation proposed 22
Legislation proposed, State Engineer's duties 8
Liberty Mills, Free bridge, Hudson river, gaging station 509–10
Lighthouse, Keuka lake outlet 37, 188, 236
Limestone creek:
  Description 392–3
  Gaging stations:
    Fayetteville 393–4
    Manlius 395–6
Little Falls, above State dam, Mohawk river, gaging station 460–2
Little Falls, lower dam, Mohawk river, gaging station 458–60
Little Falls, near, Erie canal, gaging station 462
Little Falls, preservation of historic lock and bridge recommended.. 31
Liverpool, Mud lock, near Long Branch, Seneca river, gaging station. 400–1
Liverpool, Onondaga outlet, near Long Branch, gaging station 402
Lock construction, a feature of 16
Long Branch, Liverpool, Mud lock, Seneca river, gaging station 400–1
Long Branch, Liverpool, Onondaga outlet, gaging station 402
Lower Hudson river drainage basin:
  Description 434
  Gaging stations:
    Olive Bridge, Esopus creek, at weir 436–7
    Rosendale, Rondout creek 437–8
    Rossman, Kinderhook creek 434–5
    South Cairo, Catskill creek 436
Lunacy Commission, surveys for 30
Lyons, Clyde river, gaging station 424

Maintenance and repairs of improved public highways. (*See* "Improved public highways, maintenance and repairs.")
Maintenance, Barge canal, State Engineer's report 17
Maintenance, canal, State Engineer's report 9
Manlius, Limestone creek, gaging station 395–6
Massachusetts, boundary line 23
Massena Springs, Raquette river, gaging station 334–7
Mechanicville, above Power Co.'s dam, Hudson river, gaging station. 497–8
Mechanicville, below Power Co.'s dam, Hudson river, gaging station. 496–7
Mechanicville, B. & M. R. R. bridge, Hudson river, gaging station.. 500–1
Mechanicville, Toll bridge, Hudson river, gaging station 499
Mechanicville, West Va. Pulp and Paper Co.'s mill, Hudson river, gaging station 499–500
Medina aqueduct, report concerning 269
Memorial of early canal navigation, report 303–6
Memphis, foot of Jack's reef, Seneca river, gaging station 407–8

PAGE.

- Metal used on canals, inspection of 14–15
- Middleburg, Schoharie creek, gaging station 451–2
- Middle division:
  - Engineering expenses. (*See* "Engineering expenses.")
  - Engineer's report 125–84
- Minetto, above dam, Oswego river, gaging station 363
- Minetto, below dam, Oswego river, gaging station 362
- Mohawk river drainage basin:
  - Description 438–9
  - Gaging stations:
    - Canajoharie, Mohawk river 455
    - Central Bridge, Schoharie creek 450
    - Cohoes, Mohawk river 441–2
    - Delta, above dam, Mohawk river 491–2
    - Delta, below dam, Mohawk river 490–1
    - Delta, near lock No. 7, Mohawk river 489–90
    - Dolgeville, East Canada creek 456–8
    - Dunsbach Ferry, Mohawk river 442–4
    - Fonda, Fultonville bridge, Mohawk river 453–4
    - Fort Hunter, Schoharie creek 449
    - Fort Plain, Mohawk river 455–6
    - Herkimer, Mohawk river 462–4
    - Kast bridge, near Herkimer, West Canada creek 465–7
    - Little Falls, above State dam, Mohawk river 460–2
    - Little Falls, Erie canal 462
    - Little Falls, lower dam, Mohawk river 458–60
    - Middleburg, Schoharie creek 451–2
    - Poland, West Canada creek 468–9
    - Powell's bridge, near Stittville, Nine-Mile creek 481–3
    - Prattsville, Schoharie creek 453
    - Rexford Flats, Mohawk river 445
    - Rome, above State dam, Mohawk river 483–5
    - Rome, below State dam, Mohawk river 483
    - Rome, Floyd avenue, Mohawk river 485–6
    - Rome, near, Ridge Mills, above dam, Mohawk river 488
    - Rome, near, Ridge Mills, below dam, Mohawk river 486–7
    - Schenectady, Mohawk river 446
    - Trenton Falls, above Morgan dam, West Canada creek 470
    - Trenton Falls, above Power Co.'s dam, West Canada creek. 470–2
    - Tribes Hill, Mohawk river 446–7
    - Twin Rock bridge, near Grant, West Canada creek 472–5
    - Utica, Mohawk river 479–80
    - Waterford, Mohawk river 439–41
    - Wilmurt, West Canada creek 478–9
  - Rain gages:
    - Description 475
    - Deerfield reservoir, near Utica, Mohawk river basin 481

Mohawk river drainage basin — (*Continued*):
Rain gages — (*Continued*): PAGE.
Graefenburg hydrophysical station, near Utica, Mohawk river basin 481
Hoffmeister, West Canada creek basin........ 476
North lake, near Atwell, West Canada creek basin........ 477
Savage reservoir, near Utica, Mohawk river basin........ 481
Twin Rock bridge, near Grant, West Canada creek basin.. 477
"Money system" repair of highways, engineering expenses......36, 114, 119
Mongaup river drainage basin, description and gaging station at Rio. 536–8
Monuments and maps, examination, engineering expenses........37, 115, 119
Monuments, boundary, State Engineer's duties........ 23
Moose river, description and gaging station at Moose River village. 341–3
Moses kill, mouth of, near Fort Miller, Hudson river, gaging station. 515–16
Mosquito Point bridge, Port Byron, Seneca river, gaging station.... 410–11
Mt. Morris, Genesee river, gaging station........ 350–52
Mud lock, near Long Branch, Liverpool, Seneca river, gaging station. 400–1

Navigable streams, improvement of and State sovereignty over, recommended 28–9
Navigation, closed on Oswego canal........ 127
Navigation, uninterrupted on Black River, Cayuga and Seneca, and Erie canals 127
Neversink river drainage basin, description and gaging station at Godeffroy 534–6
Newark, north of, Ganargua creek, gaging station........ 425
New Jersey, boundary line........ 23
Niagara river drainage:
Description 431
Gaging stations:
Pendleton, change bridge, Erie canal........ 431
Tonawanda, Main street bridge, Erie canal........ 431–2
Tonawanda, Niagara river 432
Nine-Mile creek, Powell's bridge, near Stittville, gaging station.... 481–3
North lake, near Atwell, West Canada creek basin, rain gage..465, 475, 477
Northumberland, above dam, Hudson river, gaging station........ 510–11
Northville, Sacandaga river, gaging station........ 523

Oak Orchard, above dam, Oneida river, gaging station........ 381
Oak Orchard, below dam, Oneida river, gaging station........ 380
Ogdensburg, Oswegatchie river, gaging station........ 331–3
Olive Bridge, Esopus weir, gaging station........ 436–7
Oneida creek, description and gaging station at Kenwood........ 386–8
Oneida river drainage basin. (*See* "Oswego–Oneida–Seneca river drainage basin.")
Onondaga creek, description and gaging station at Temple street, Syracuse 401–4
Onondaga lake, Syracuse, gaging station........ 403
Onondaga outlet, near Long Branch, Liverpool, gaging station..... 402

PAGE.

- Ordinary repairs to canals, engineering expenses. (See "Engineering Expenses.")
- Oswegatchie river, description and gaging station near Ogdensburg. 331–3
- Oswego, above Curved dam, Oswego river, gaging station 359
- Oswego, above High dam, Oswego river, gaging station 361
- Oswego, below High dam, Oswego river, gaging station 360
- Oswego canal:
  - Navigation closed 127
  - Portions under contract 12
  - (*See also* "Barge canal" *and* "Contracts.")
- Oswego Falls, above dam, Oswego river, gaging station 370
- Oswego–Oneida–Seneca river drainage basin:
  - Description 353–4
  - Drainage areas 354–7
  - Gaging stations, Oneida river basin:
    - Brewerton, highway bridge, Oneida lake 384
    - Caughdenoy, above lock, Oneida river 383
    - Caughdenoy, below lock, Oneida river 382
    - Chittenango, Chittenango creek 389–92
    - Fayetteville, Limestone creek 393–4
    - Jamesville, near, Butternut creek 396–7
    - Kenwood, Oneida creek 386–8
    - Manlius, Limestone creek 395–6
    - Oak Orchard, above dam, Oneida river 381
    - Oak Orchard, below dam, Oneida river 380
    - Schroeppel's bridge, Euclid, Oneida river 379–80
    - Sylvan Beach, Fish creek 385
    - Three River Point, Oneida river 378
  - Gaging stations, Oswego river basin:
    - Battle Island, above dam 367
    - Battle Island, below dam 366
    - Battle Island, opposite 364–5
    - Fulton, above lower dam 369
    - Fulton, above upper dam 370
    - Fulton, mouth of Waterhouse creek 368
    - Hinmansville bridge 374
    - Horseshoe dam, above site of 373
    - Horseshoe dam, below site of 372
    - Minetto, above dam 363
    - Minetto, below dam 362
    - Oswego, above Curved dam 359
    - Oswego, above High dam 361
    - Oswego, below High dam 360
    - Oswego Falls, above dam 370
    - Ox creek, at mouth of 371
    - Phoenix, above dam 376
    - Phoenix, below dam 375
  - Gaging stations, Seneca river basin:
    - Alloway, Canandaigua outlet 427–9

Oswego–Oneida–Seneca river drainage basin — (*Continued*):
  Gaging stations, Seneca river basin — (*Continued*): PAGE.
    Baldwinsville, above dam, Seneca river.............. 405, 406–7
    Baldwinsville, below dam, Seneca river.................. 405–6
    Belgium, highway bridge, Seneca river.................. 400
    Canandaigua, Canandaigua lake and outlet............... 429
    Clyde, Clyde river..................................... 423
    Fox Ridge, railroad bridge, Seneca river................ 411–12
    Gascon reef, near Belgium, Seneca river................. 399
    Geneva, above regulation works, Seneca river............ 421–2
    Geneva, below regulation works, Seneca river............ 420–1
    Ithaca, Cayuga lake..................................... 414–15
    Jordan, above Jack's reef, Seneca river................. 408–9
    Jordan, at highway bridge above Cross lake, Seneca river. 409–10
    Long Branch, near Liverpool, Onondaga outlet............ 402
    Lyons, Clyde river 424
    Memphis, foot of Jack's reef, Seneca river.............. 407–8
    Mud lock, near Long Branch, Liverpool, Seneca river..... 400–1
    Newark, north of, Ganargua creek........................ 425
    Palmyra, Ganargua creek 425–6
    Port Byron, Mosquito Point bridge, Seneca river......... 410–11
    Seneca Falls, above locks, Seneca river................. 417–18
    Seneca Falls, below lock No. 6, Seneca river............ 416–17
    Seneca Falls, below lock No. 7, Seneca river............ 415–16
    Syracuse, Onondaga lake................................. 403
    Syracuse, Temple street, Onondaga creek................. 403–4
    Waterloo, above, Seneca river........................... 419–20
    Waterloo, below, Seneca river........................... 419
    West Mud lock, near Cayuga, above, Seneca river......... 413–14
    West Mud lock, near Cayuga, below, Seneca river......... 413
    Willow Glen, Skaneateles lake outlet.................... 430
  Oneida lake and river:
    Description 353, 377
    Drainage areas 354–5
    Water-gages, locations 377
  Oswego river:
    Description 353, 358
    Drainage areas 357
    Water-gages, locations 358
  Seneca river:
    Description 353, 398
    Drainage areas 356–7
    Water-gages, locations 398
Owego, Susquehanna river, discharge measurement............. 541
Ox creek, mouth of, Oswego river, gaging station............ 371

Palmyra, Ganargua creek, gaging station..................... 425–6
Park sites, along Barge canal, recommendation............... 19
Pendleton, change bridge, Erie canal, gaging station........ 431

PAGE.

Pennsylvania, boundary line 23
Phoenix, above dam, Oswego river, gaging station 376
Phoenix, below dam, Oswego river, gaging station 375
Plattsburg, Saranac river, gaging station 329–31
Poland, West Canada creek, gaging station 468–9
Port Byron, Mosquito Point bridge, Seneca river, gaging station... 410–11
Port Jervis, Delaware river, gaging station 531–3
Powell's bridge, near Stittville, Nine-Mile creek, gaging station 481–3
Prattsville, Schoharie creek, gaging station 453
Protection wall, west side Skaneateles lake outlet 128
Preservation of records, recommended 29
Prison Commission, survey for 30
Public Works, Department of, coöperation with 51, 187
Public Works, Superintendent of, work of, commended 9

Rain gages:
  Description 475
  Black creek at Gray, West Canada creek basin 475
  Deerfield reservoir, near Utica, Mohawk river basin 481
  Graefenburg hydrophysical station, near Utica, Mohawk river basin 481
  Hoffmeister, West Canada creek basin 465, 475, 476
  Honnedaga, West Canada creek basin 465
  North lake, near Atwell, West Canada creek basin 465, 475, 477
  Savage reservoir, near Utica, Mohawk river basin 481
  Trenton Falls, West Canada creek basin 465, 475
  Twin Rock bridge, near Grant, West Canada creek basin.. 465, 475, 477
Raquette river, description and gaging station at Massena Springs.. 334–7
Recommendations:
  "Blue line," surveying and monumenting 30
  Boundary lines, State 23, 24
  Charting of streams and lakes utilized for Barge canal 17–18, 19
  Civil service amendment 31
  Comptroller's fund for surveys 31
  Court of Claims 21
  Fire-proof depositories for records 29
  Hudson river canalization, for Barge canal 12–13, 19
  Land Bureau 22
  Maintenance of Barge canal 17, 19
  Navigable streams, improvement of and State sovereignty over.. 28–9
  Park sites along Barge canal 19
  Records, preservation of 29
  Repair of historic lock and bridge, Little Falls 31
  Surveys for State departments 30
  Survey, topographic 26
  Water-power development incidental to Barge canal construction. 18, 19
  Water records of Cayuga and Cross lakes and Seneca river 129–30
  Weigh-lock building, Syracuse 130

PAGE.

- Records, preservation of, recommended 29
- Red House, Allegheny river, gaging station 549–51
- Reports:
  - Bridges, bureau of 266–8
  - Cayuga and Seneca canal proposition, State Engineer's report to Senate 243–8
  - Cayuga and Seneca canal survey 249–52
  - Division engineers:
    - Eastern 49–124
    - Middle 125–84
    - Western 185–240
  - Land bureau 263–5
  - Memorial of early canal navigation 303–6
  - New York-Connecticut boundary line 285–94
  - Resident engineers. (*See* "Barge canal, Residencies.")
  - Sault Ste. Marie canal lock 295–301
  - State Engineer and Surveyor 7
  - Stream gaging 313–552
  - Testing laboratory 255–62
  - Tests of concrete arches 268, 269–83
  - U. S. topographic survey 307–11
- Residencies, Barge canal. (*See* "Barge canal, Residencies.")
- Rexford Flats, Mohawk river, gaging station 445
- Richelieu river, at Fort Montgomery, gaging station 324–6
- Ridge Mills, near Rome, above dam, Mohawk river, gaging station 488
- Ridge Mills, near Rome, below dam, Mohawk river, gaging station 486–7
- Rio, Mongaup river, gaging station 537–8
- Rivers and lakes, charting of canalized, recommended 17–18, 19
- Rochester, Allen street bridge 36, 188, 189, 234, 236, 239, 266
- Rochester, aqueduct, Erie canal, gaging station 350
- Rochester, Elmwood avenue, gaging station 203, 346–8
- Rochester, Lyell avenue bridge 36, 38, 188–9, 234, 236, 237, 266
- Rome, above State dam, Mohawk river, gaging station 483–5
- Rome, below State dam, Mohawk river, gaging station 483
- Rome, Floyd avenue, Mohawk river, gaging station 485–6
- Rome, Ridge Mills, above dam, Mohawk river, gaging station 488
- Rome, Ridge Mills, below dam, Mohawk river, gaging station 486–7
- Rondout creek, Rosendale, gaging station 437–8
- Rosendale, Rondout creek, gaging station 437–8
- Rossman, Kinderhook creek, gaging station 434–5

- Sacandaga river, description and gaging station at Northville 522–3
- Sand tests, report 261
- Saranac river, description, drainage areas and gaging station near Plattsburg 328–31
- Saratoga lake outlet, Burgoyne, Hudson river, gaging station 508
- Saratoga Reservation Commission, survey for 30

PAGE.

Sault Ste. Marie canal lock, report of inspection of an accident.. 295–301

Savage reservoir, near Utica, Mohawk river basin, rain gage...... 481

Savannah P. O., R. R. bridge near Fox Ridge, Seneca river, gaging station 411–12

Schenectady, Mohawk river, gaging station........ 446

Schoharie creek drainage basin:
  Description 448
  Drainage areas 448
  Gaging stations:
    Central Bridge, Schoharie creek........ 450
    Fort Hunter, Schoharie creek........ 449
    Middleburg, Schoharie creek........ 451–2
    Prattsville, Schoharie creek 453

Schroeppel's bridge, Euclid, Oneida river, gaging station........ 379–80

Schuylerville, Hudson river, gaging station........ 507–8

Senate, report to, on Cayuga and Seneca canal........ 243–8

Seneca canal. (*See* "Cayuga and Seneca canal.")

Seneca Falls, above locks, Seneca river, gaging station........ 417–18

Seneca Falls, below lock No. 6, Seneca river, gaging station........ 416–17

Seneca Falls, below lock No. 7, Seneca river, gaging station........ 415–16

Seneca Falls, Ovid street bridge........ 36, 128, 175, 178, 266

Seneca river drainage basin. (*See* "Oswego–Oneida–Seneca river drainage basin.")

Seneca river, water records........ 129–30, 183

Sidney, Susquehanna river, discharge measurement........ 541

Skaneateles lake, drainage areas........ 430

Skaneateles lake outlet, west side, protection wall........ 38, 128, 179

Skaneateles lake outlet, Willow Glen, gaging station........ 430

Snook kill, mouth of, near Fort Edward, Hudson river, gaging station 516–17

South Cairo, Catskill creek, gaging station........ 436

Special works:
  Contracts completed........ 38, 179, 183
  Contracts pending 188
  Description 127–9
  Engineering expenses 36, 175–6, 178, 234, 236

State Architect, testing for........ 20

State Engineer and Surveyor:
  Coöperation with U. S. Geological Survey........ 8, 24–7, 307–11
  Department's administration 32
  Duties 7–8, 31
  Report........ 7
  Report to Senate on Cayuga and Seneca canal........ 243–8

State highways 19

Steel used on the canals, inspection of........ 14–15

Stillwater, below dam, Hudson river, gaging station........ 505–6

Stillwater, highway bridge, Hudson river, gaging station........ 506–7

Stittville, Powell's bridge, Nine-Mile creek, gaging station........ 481–3

PAGE.

- St. Lawrence river drainage:
  - Description 322
  - Drainage area 322
  - (*See also* "Oswegatchie river," "Raquette river," *and* "Lake Champlain drainage basin.")
- Stone bridge, relic at Little Falls, recommendation 31
- Stream gaging:
  - Report on 26, 313–552
  - (*See* gaging stations, by name, for details.)
- Surveys:
  - Barge canal:
    - Erie canal, contract No. 23 194
    - Erie canal, contract No. 63 194
    - Erie canal, residency No. 2 56–7
    - Erie canal, residency No. 4 74
  - Buffalo, Georgia street bridge 37, 188, 235, 236
  - Cayuga and Seneca canal:
    - Engineering expenses 37, 117, 119, 176–7, 178
    - Report 129, 249–52
  - Comptroller's fund for, recommended 31
  - Court of Claims:
    - Engineering expenses 37, 116, 119, 177, 178, 235, 236
    - Reports 20–21, 51, 129, 187
  - Dresden landing and pier 37, 188, 235, 236
  - For State departments, by State Engineer, recommended 30
  - Hydrographic, coöperative:
    - Engineering expenses 37, 118, 119
    - Report 26–7, 315
    - (*See* names of streams, basins and localities for details.)
  - Keuka lake outlet, lighthouse 37, 188, 235, 236
  - Lunacy Commission 30
  - Mohawk street bridge, Waterford 37, 116, 119
  - Monuments and maps, examination 37, 115, 119
  - Prison Commission 30
  - Saratoga Reservation Commission 30
  - Seneca Falls, Ovid street bridge 36, 128, 175, 178, 266
  - Topographic, coöperative:
    - Allotments 309
    - Engineering expenses 37, 117–18, 119
    - Field work 310
    - Office work 311
    - Progress to date 310
    - Recommendation 26
    - Report 24–6, 307–11
    - Résumé of results 309–10
  - U. S. Geological, coöperation with 8, 24–7, 307–11, 315
  - Utica, Seneca street bridge 36, 128, 176, 178, 266
- Susquehanna river drainage basin:
  - Description 538–9

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